

TAR FLAT AND THE TRANSBAY TERMINAL

Study of Historic Potential
Hazardous Materials Sites



Looking North from 1st and Howard in 1852: The Transbay Terminal Site with the First Iron Foundries on the Pacific Coast.

CALTRANS Transbay Terminal Viaduct Seismic Retrofit

Roger Wolcott Olmsted, 1993

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Tar Flat and The Transbay Terminal:

A Survey of Historic Potential Hazardous Materials Sites

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Addendum to this edition:

Map 1A: Project Location of the Trans-Bay Terminal showing its relationship to the previous SF-480 Terminal Separation toxic study. Follows Page 2 and Map 1.

INTRODUCTION

SCOPE OF WORK

This survey of historic industries with a potential for past deposition of hazardous materials on the site of the Transbay Terminal continues and extends previous research on historic industries in San Francisco's Tar Flat district. Research on historic Tar Flat industries commenced in 1991 as an integral part of an historic cultural archaeological resource study, *Tar Flat, Rincon Hill, and the Shore of Mission Bay* (Praetzellis, Olmsted et al., 1992; 1994), undertaken in compliance with Section 106 of the National Historic Preservation Act in conjunction with the SF-480 Terminal Rebuild Project. In the course of cultural resource research for that report, many 19th-century industries were located and studied, such as iron foundries, non-ferrous metals industries, and a large lead works and paint factory. Beyond the potential significance of such industrial sites as cultural resources, they also present a likelihood of associated hazardous materials contamination. The significance of such contamination extends beyond any cultural value the sites may have as archaeological resources; accordingly, further research on these potentially hazardous historic industries formed the basis of a separate report on these potential hazardous materials sites, *Tar Flat: 19th Century Solutions, 20th Century Hazards* (1992, reprinted 1993). The present study follows the method and format developed for that report.

The present report studies a three block area bounded by Mission, Howard, Beale, and Second streets; these three blocks are the sites of the Transbay Terminal East, Center, and West Units, and portions of the viaduct approaches to the terminal.

Chapter I describes the history of the San Francisco Gas Light Company works, located from 1852 to 1896 on the north side of Howard Street between Beale and First, immediately south of the Transbay Terminal Center and East Units.

Chapter II details the other potentially hazardous historic industries that were located within the three-block study area, locating the specific sites of these industries on maps of each block. To retain consistency with the previous *Tar Flat* study, the three blocks are designated as Blocks C, D, and E, as marked on Map 2.

Chapter III discusses the historic potential for hazardous materials contamination in relation to the right-of-way of the Transbay Terminal approach viaduct, and the adjacent Fremont Street ramp structure of I-80; the viaduct and the ramp are structures for which seismic retrofitting is projected. This chapter briefly summarizes relevant information

from the earlier *Tar Flat* study, updates that study with new research concerning specific potentially hazardous industries, and covers the historic industrial land use of those sections of the viaduct right-of-way that are outside the SF-480 right-of-way primary study area of the earlier *Tar Flat* survey. Chapter III retains the block number designations of *Tar Flat*; the individual blocks considered are numbered 2-5.

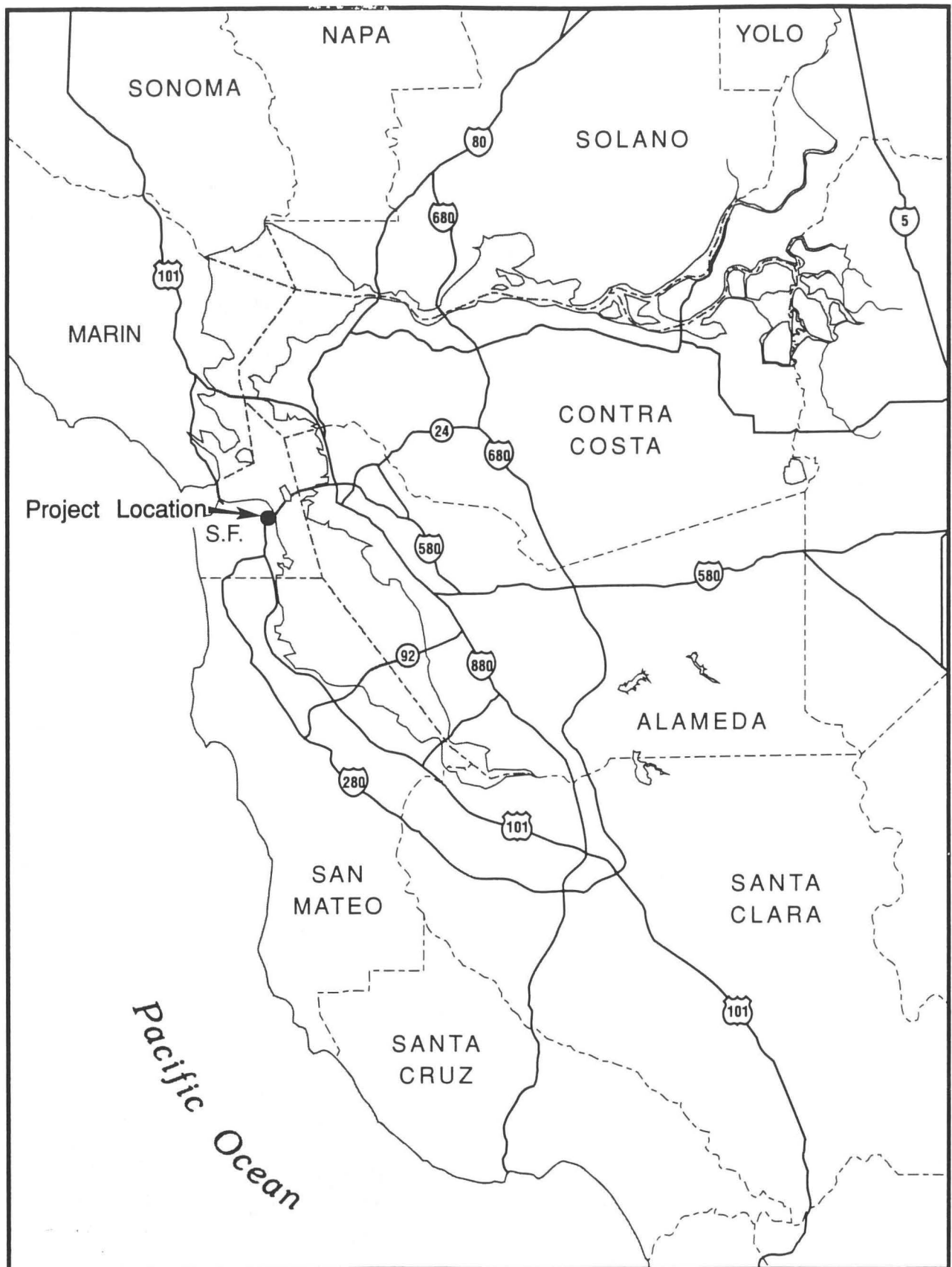
The study period covered is from the first recorded indications of industry on the Transbay Terminal site, 1850, extending up to 1936-1938, when the right-of-way for the terminal was clear of existing industrial structures.

Limits to the Study: The study described in detail historic land uses that relate to the presence or absence of potentially hazardous industries, from the standpoint of 19th-century technological processes. This study does not attempt to make decisions or predictions based on chemical or engineering data. Instead, the study attempts to provide engineers with relevant information on specific locations. The study involved consideration of industrial processes on the site that were recorded in historic manuscripts, newspaper and periodical articles, historically contemporary descriptions of specific industries, maps, photographs, drawings, business directories, and municipal sources.

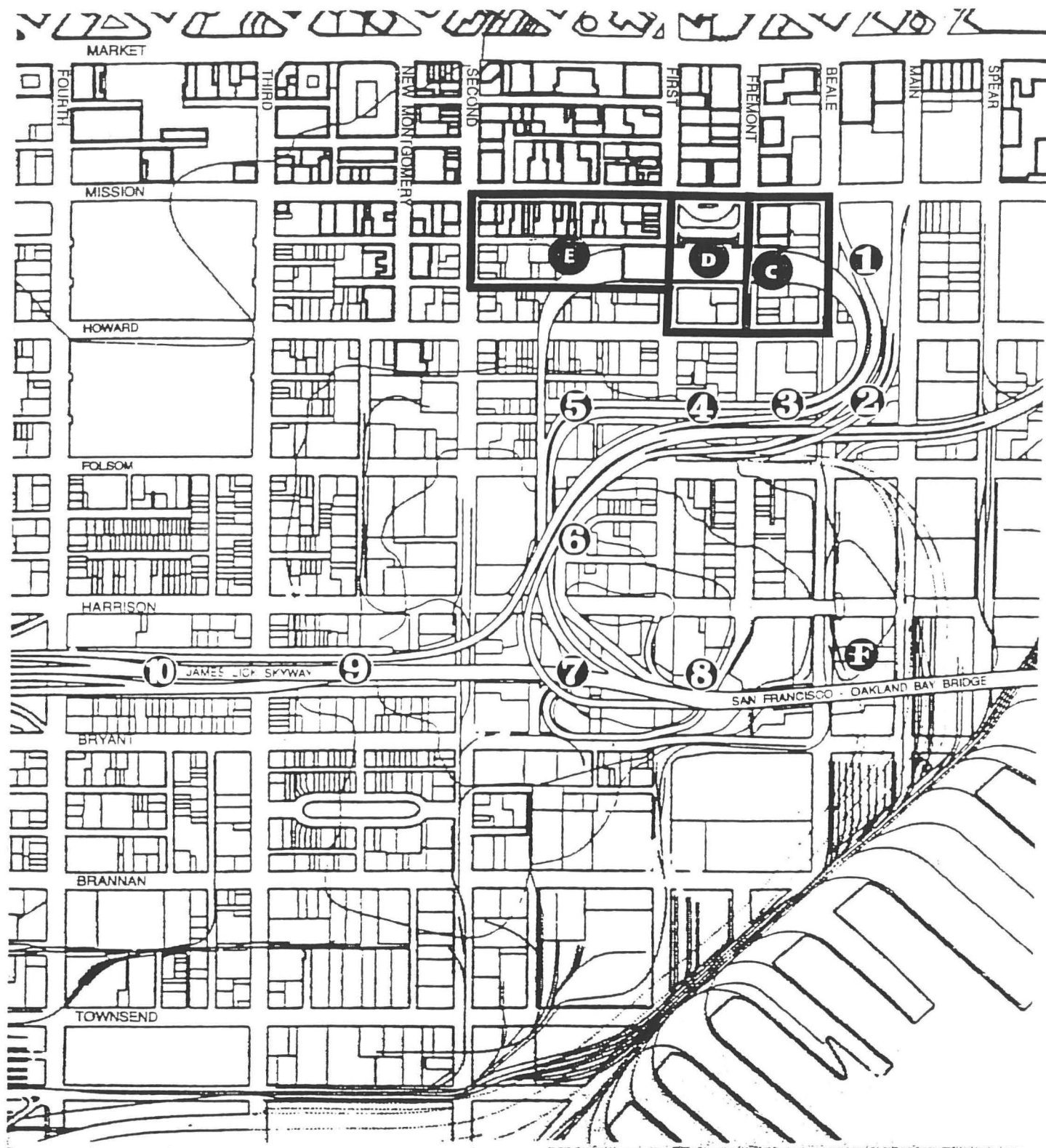
Background and Method

Although historians have known that the South of Market district of San Francisco was the site of many industries in the 19th and early 20th centuries, there was little documented historical research on these industries when cultural resource surveys were undertaken in conjunction with the SF-480 Terminal Rebuild Project as an aid to archaeological study of the site in 1991-1992. The methods used in this study were developed at that time to focus historical research on the problem of historic potential hazardous materials contamination within the "Tar Flat" area.

Because Tar Flat was the earliest site of heavy industry in San Francisco, or indeed the West Coast, a multiplicity of iron and brass foundries, blacksmith shops, boat building yards, woodworking plants, metal working, plating, machine shops, coal yards, ink factories, paint shops, lithographers, and warehouses were found to be present. Individual industries frequently moved from site to site within the same or nearby blocks, and were subject to corporate name changes over the decades. The area reached a peak of industrial activity in the 1890s, and continued as a major concentration of the



Map 1: Project Location: Trans-Bay Terminal - Toxic Study



Map 1A: Project Location of the Trans-Bay Terminal showing its relationship to the previous SF-480 Terminal Separation toxic study.

metal industry until the depression of the 1930s and changing technology made these industries obsolete. For every major industry, such as the San Francisco Gas Works Company, there were many smaller foundries and machine shops on the project site.

Small industries on the site that were deemed to have little or no potential for depositing hazardous wastes were excluded from this study. For example: saloons, retail shops, residential boarding houses, tobacconists, carpenters, as well as entirely residential blocks--during that time when they were solely residential before the 1906 fire. As well, larger industries engaged in such activities as food-processing are also considered to have little or no potential for depositing hazardous materials, and are therefore merely noted for their presence. As a result, the survey identifies areas where there is no evidence of past hazardous materials contamination, as well as those areas where such contamination is possible or likely.

Central Research Tools: Maps, Photographs & City Directories: It was first necessary to assemble all valid and relevant maps to ascertain the natural site and subsequent changes. U.S. Coast Survey Charts from 1852/53 and 1857/59, remain the two most useful research tools to understanding the rapid changes in filling that took place in Yerba Buena Cove.

The Sanborn Maps, starting in 1887 and including updates for 1899, 1913, 1913 updated to 1929, and 1913 updated to 1948, remain the most important key maps for later industrial research in San Francisco. Not only Sanborn maps site-specific with accurate measurements, but they also include information about activities that were fire hazards, such as paint storage, and sometimes yield clues about structural details, i.e. the presence of "earth floors," which allows a better assessment of potential release of hazardous materials.

During the construction of the Bay Bridge and the Transbay Terminal official photographers documented every stage of construction, including a photographic inventory of buildings acquired by the State and slated for demolition to make way for the Terminal and its approaches. These photographs not only document buildings, but also give clues to subsurface conditions. For example, an industrial chemical supply company building on Block 3 is shown in the process of demolition, revealing a basement which is not listed on Sanborn maps. Instead, the basement appears to have been a survival of the Pioneer White Lead and Color Works warehouse and white lead mill, which burned in 1896 and again in 1906. These photographs, stored at the Bay Bridge Toll Plaza, form an invaluable historical archive.

San Francisco business directories, beginning in 1859, and continuing through our cut-off date of 1939, help to establish the changes and industrial development on the site. The directories are especially valuable for the period prior to the first Sanborn Map in 1887. Early directories often do not contain specific street addresses; the general locations they have been more precisely located, insofar as possible, through visual and other documentary sources.

Manuscript sources include autobiographical dictations of several of the more prominent industrialists and foundrymen of Tar Flat, many of which were taken by H. H. Bancroft for use in his 8-volume *History of California*, 1884-1890, provided data concerning the histories locations of particular industries. Likewise, the scrapbooks of J.S. Hittell, which formed the basis of his *Commerce and Industries of the Pacific Coast of North America* (1882), were sources for the information on industrial processes in this survey.

The Relation of Historic Research to Assessing Potential Hazardous Materials Sites

Hazardous materials have seldom been directly documented in the historical record. In the past, public agencies neither kept, nor required the keeping, of records of waste generation, storage, or disposal. Most intentional references to hazardous wastes in historical records appear when their disposal became such an immediate problem as to constitute a public nuisance. Even here, observations tend to be limited to direct public health problems, offensive smells or sights, or the destruction of wildlife, rather than to the exact type or quantity of the waste discharged.

It is often difficult to discover if a particular industry was careful or not in handling or disposing of hazardous materials. In general, since the local groundwater in the project area was not used for drinking purposes after the 1860s-1870s, there was no particular reason not to dump liquid or powdered wastes in yards, sumps, or street gutters. During the period prior to World War II (or even more recently) waste was disposed of in the cheapest and most convenient way possible; prior to the development of motorized trucking this could often mean on-site disposal. Any historic industry on the site using known hazardous materials could, therefore, be considered at least a possible source of contamination.

This view should be tempered by common sense and the application of all available data. In determining the possible residual historic contamination of a site, there emerge three categories to consider.

First, are those areas which:

- 1) were the site of large-scale industrial activity over a substantial, well-documented period of time,*
- 2) involved known hazardous substances in quantity,*
- 3) where either the industrial process, the structure in which it was carried out, or some event such as a fire could probably have resulted in a release of hazardous materials into the soil, and,*
- 4) where intervening changes of topography make it probable that the substance may still be present.*

Second, areas appear where it is unlikely that there is any historic hazardous materials contamination because:

- 1) the area was residential, and potentially hazardous waste disposal was restricted to limited quantities of household chemicals,*
- 2) industrial use involved products and processes unlikely to be hazardous, such as food processing, and,*
- 3) subsequent historic land use does not suggest the likelihood of hazardous materials contamination.*

Third, a large intermediate category exists of areas which show some probability of historic hazardous materials contamination, but do not present an altogether clear picture. These sites often include areas used for industry which may probably have used hazardous materials, but did not necessarily involve documented on-site disposal or long-term storage, or the intervention of some definite event likely to have caused spillage onto the soil. Rather than simply leaving these sites in limbo, an effort has been made to evaluate them in terms of common sense variables. These include:

- 1) the type of structure in which the industry was conducted; generally, a building known to have a concrete floor may be considered less of a hazard than a building with an earth floor;*
- 2) the type of soil of the site; filled land may be more likely to absorb hazardous materials than hard rock; in this regard, the subsequent cutting*

or filling of a site should be evaluated by engineers to assess its significance in making a rough determination of its potential contamination;

3) the overall context in which the industrial activity was carried out can correlate with the general degree of care shown--for example, photographic research has shown that vacant lots in largely residential areas of the Rincon Hill neighborhood tended to be empty fields, whereas similar lots in purely industrial areas were used for machinery and waste storage.

Use of Sanborn Maps

In presenting research findings in this survey, historic industries with potential for hazardous materials contamination have been located and marked on Sanborn maps that are reproduced in this report. Sanborn maps that were studied included the dates 1887, 1899, 1913, and 1913 updated to 1929. Sanborn maps updated to 1948 have been used for study purposes to locate the Transbay Terminal and its viaduct structures in relation to earlier industrial sites.

Since Sanborn maps show buildings from the point of view of potential fire hazards, and only incidentally record the industries that occupied those buildings, one of the main efforts in this report has been to relate data from business directories and other archival sources to Sanborn maps. Sanborn maps are also limited by the dates of periodic updates and revisions. Potentially hazardous industries that ceased operations on a particular site prior to 1887 do not appear on any Sanborn map, though it is sometimes possible to identify probable structures surviving from such early industries and put to new uses. A similar problem arises with industries housed in temporary structures in the years immediately following the 1906 fire; between 1906 and the 1913 edition of the Sanborn maps, many lightly-built industrial buildings were erected in Tar Flat, and while some survived for decades, others may have been replaced by quite different structures and land uses before 1913. Finally, the period of years that some businesses were tenants of a site can fall between the dates of Sanborn Map updates and editions. An example of such an industry is a chemical supply company that moved into a building on Beale Street after the 1913/29 Sanborn Map was surveyed, and left the location when the building was demolished to clear the Transbay Terminal viaduct right-of-way. Despite these limitations, putting together Sanborn maps of any one site together yields a series that includes most post-1887 industries. For this study, reproductions of the Sanborn

maps of individual blocks have been shaded and keyed to show relevant potentially hazardous industries, rather than just those indicated on the edition of the original map.

Reproduction of Sanborn Maps in this Study

For the two study blocks that are the site of the East and Center Units of the Transbay Terminal, both 1887 and 1913 Sanborn maps have been reproduced, with pre-1906 industries shaded on the 1887 map, and post-1906 industries on the 1913/29 map. For the block west of First Street that is the site of the Transbay Terminal West Unit, a 1913 map is reproduced instead on two facing pages; pre-1906 industries are included on this map. of 1887, to show industries that moved into previously residential streets in the 1890s. Two additional maps covering portions of the Transbay Terminal viaduct have also been reproduced in Chapter III to indicate the locations of specific industrial sites that were not included in the 1992 *Tar Flat* report.

This report has differentiated between potentially hazardous sites primarily in terms of the types of materials that were commonly used in industry. The many ferrous metal working industries, such as iron foundries, machine shops, tool and die works, and automobile parts warehouses and garages, have been shaded in light grey; industries primarily using non-ferrous metals, such as brass foundries, melting plating works, sheet metal works, paint factories, printing shops, and chemical works have been shaded in darker grey. Industries primarily involved in hydrocarbons have also been shaded in darker gray, as have asbestos industries.

The Natural Site

The presence of Yerba Buena Cove was a principal reason why the general area of the Transbay Terminal site became the Tar Flat industrial district. The section of Yerba Buena Cove that lay north of Market Street formed the original anchorage of Gold Rush San Francisco; by 1850 it was crowded with wharves, warehouses, derelict ships, and the expanding city front. The shore of the cove south of Market Street was left to become the industrial nucleus of the expanding city.

The earliest accurate and complete depiction of the Transbay Terminal site is San Francisco's first U.S. Coast Survey Chart, published in 1853, carrying survey information from February of 1852, and reproduced as Map 2. The map shows both the original shoreline of Yerba Buena cove together with filling that had taken place since 1848. On the Transbay Terminal site, no filling is shown as having taken place, with the original shoreline still extending, in 1852, from a point near the intersection of Fremont and Howard to Mission Street approximately 100 feet northeast of First. Thus, the eastern portion of the Terminal building, including much of the Center Unit, rests on land that was originally part of Yerba Buena Cove and was filled after February of 1852. In this area, the cove was only 1 to 2 feet deep at mean low tide, and could accommodate shallow draft vessels, such as ferryboats and river steamers, one of which can be seen crossing the cove on the site of the Transbay Terminal entrance plaza on the cover plate.

Beginning near the present intersection of First and Howard streets, a 50- to 60-foot-high ridge of sand extended southwest along the alignment of Howard Streets past Second Street. This ridge of sand originally extended almost to the bay, and was recalled by William Heath Davis in his description of life in the village of Yerba Buena in the 1840s. Davis described it as "a large sandhill standing in the vicinity of what is now Fremont Street between Howard and Folsom, and between that place and the bay at low tide was a space of about twenty feet, permitting passage along the shore to Rincon Point" (Davis 1889:16). By 1852, First Street had been cut through this ridge, but it otherwise remained little altered from its natural condition, part of it can be seen on the far right of the cover plate. To the northwest, this ridge fell steeply away to the alignment of Natoma Street; it extended westwards past Second Street.

The first daguerreotype panorama view of Yerba Buena Cove that includes the Transbay Terminal site, one section of which is reproduced on the cover of this report, and another as Plate 5, dates to 1851/52, by which time much of the natural site had

Map 2: 1852/53 United States Coast Survey



Shaded Border Outlines Transbay Terminal Study Area: Blocks C, D, & E

been dramatically altered in its appearance by the rapidly growing city. By then, First Street had been cut through the sand hills, and buildings constructed out over the beach of Yerba Buena Cove. Other parts of the natural site were much less changed from their original condition. Several visual sources document the presence through the late 1850s of the large ridge of sand, which continued to block the alignment of Howard Street between First and Second streets until it was finally cleared away circa 1860.

On the 1852/53 Coast Survey Chart, the beginning of bay filling is shown on Block D near the present location of the Transbay Terminal entrance plaza. The original shoreline is shown on that map as a dotted line diverging landwards from the line of the 1852 shore, showing where the shoreline had changed. North of Mission Street, the original shoreline was increasingly far inland of the 1852 shoreline, but only a very small portion of Block D had been filled by the time the map was surveyed 1852, while no filling had yet taken place on Block C. By the beginning of 1853, however, a substantial section of Block C had been filled to create the site for the San Francisco Gas Light Company works, which began operations in early 1854.

Technology of Filling Yerba Buena Cove

Among the most striking features shown on the 1852/53 Coast Survey Chart is the Howard Street sand ridge; many smaller dunes are indicated elsewhere on the map and in early narrative descriptions of the area. When the need to turn Yerba Buena Cove into valuable waterfront real estate became apparent, the sand hills were cut down and dumped into the cove; levelling the smaller dunes created more useful building sites at the same time. In the early 1850s, the dumping was accomplished with horses and wagons.

A technology ^{soon developed} quickly developed to expedite this cutting and filling process. The "steam paddy" used a combination of a primitive steam shovel and hopper small cars running on temporary rails. James Cunningham, and later David Hewes, operated the steam paddy. ~~Contractor~~ Hewes recalls:

I commenced the work of grading Market Street at the corner of Third and Market, where a hill was nearly as high as the present Call Building, in the fall of 1858. I also proceeded by the same plan to fill the water lots on the south side of Market Street from Fremont to Steuart, which was the east line of the Bay south of Market [Wheelan 1928:15].

The steam paddy was used ~~mainly~~ to fill the part of Yerba Buena Cove that lay south

of Market, since the area north of Market was already built-up by 1851. It is of direct relevance to the filling of Blocks C and D, and the cutting down of the sand ridge on Block E. Previously, such work had been performed by Irish immigrants--hence the term "steam paddy"; but in California the high wages of common laborers made the substitution of mechanical power especially attractive. In an age that marvelled at the new technology of the steam engine, the steam paddy attracted the attention of contemporary newspapers:

This interesting piece of machinery is now in the full tide of successful operation on First Street opposite the store of Endicott, Greene & Oakes. The superintendent of the animal, Mr. Haff, has taken a contract for excavating and grading certain lots on the south side of the street [Blocks E and 5] and for filling up the lots on the north side [Blocks D and 4].

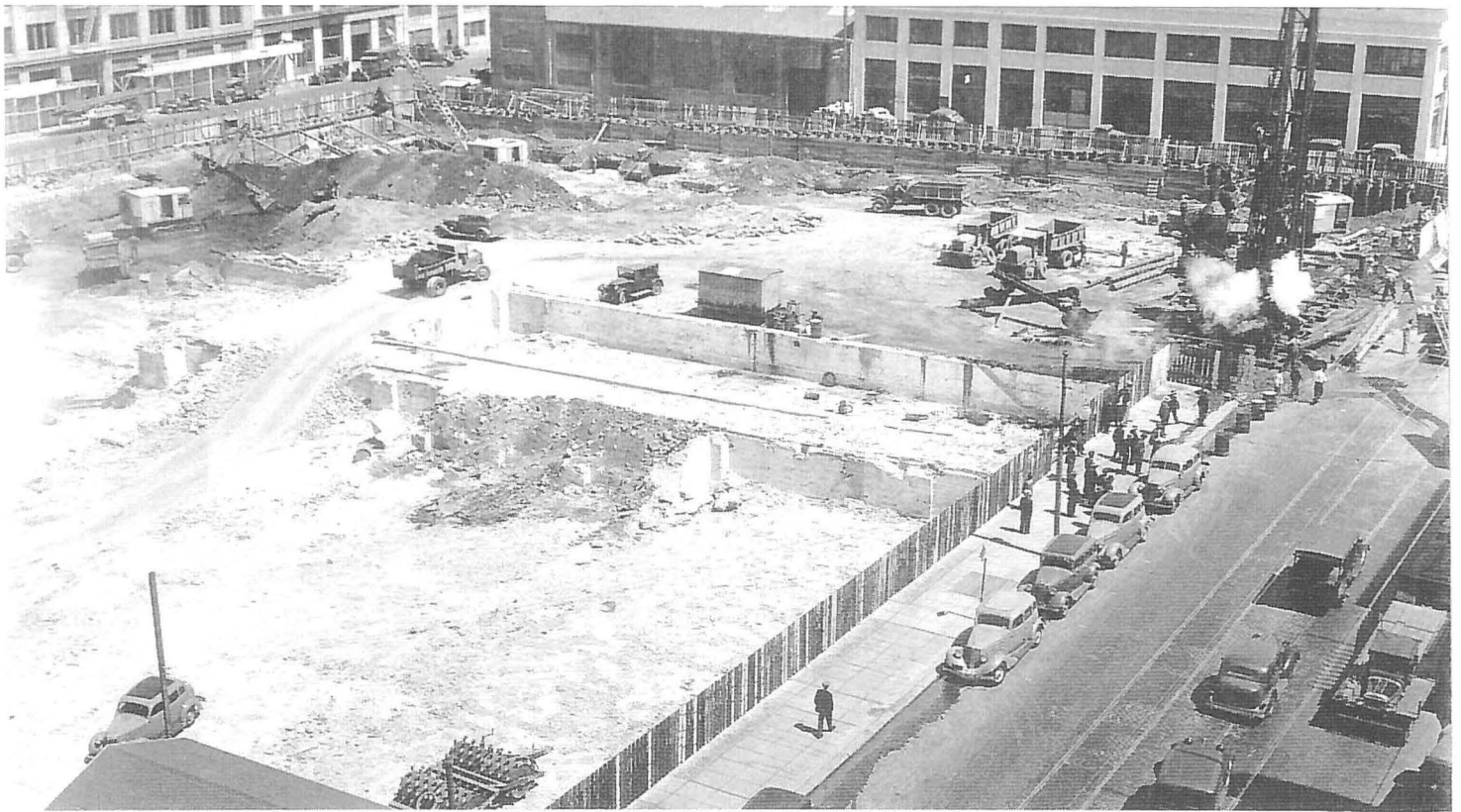
To this end, a suitable railway has been constructed along the edge of the beach as far as Market Street, furnished with large dirt cars which are drawn by horses, as locomotives have not yet arrived for this capacity.

The engine is 20 horse power and the machine is said to be capable of excavating from a sand bank 1,000 cubic yards of earth a day. . . . The sight is well worth seeing, and we advise all persons who do not believe that some things can be done as well as others, to walk down there and witness the ceremony of removing sandhills [*Picayune*, April 16, 1851].

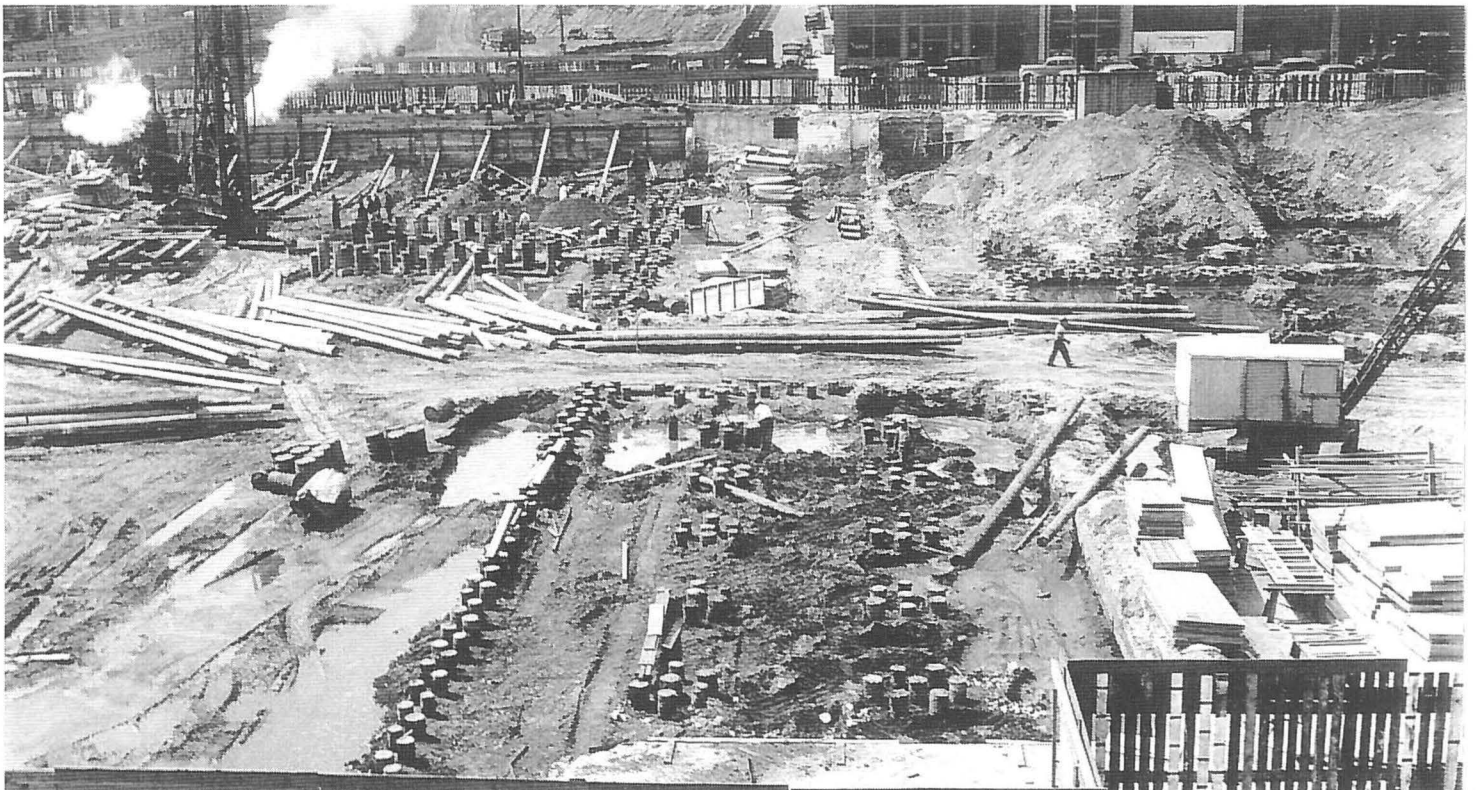
The progress of fill by 1857/59 is shown on the next published U. S. Coast Survey Chart. By then, Block D had been completely enclosed by fill, leaving a residual pool at the corner of Mission and Fremont. Filling was also well underway on Block C, with the advancing shoreline reflecting the boundaries of 100-vara lots--individual property owners were turning their water lots into potential industrial sites.

Even in the early 1850s, the amount of sand that was dumped into Yerba Buena Cove was enormous by the standards of the times. Everyone was in a hurry, and level building lots were scarce. Seemingly enormous tasks, such as levelling the hills to fill up the water lots, were accomplished so quickly that the statistics astonish the thoughtful reader today. Guesses as to the amount of levelling and filling that took place vary. Dow comments:

There is no official figure on the amount of fill dumped into Yerba Buena Cove. However, various estimates have been made. Hittell assumed that with a given area of 3,000 acres nine feet above or below the original surface, a transfer of twenty-one million cubic yards of fill was necessary, while Bancroft, calculating from the same assumption, arrived at twenty-two million cubic



Plates 1 & 2: Preparing the Site of the Transbay Terminal Center Unit exposed the original shoreline of Yerba Buena and brought to light some of the remains of Tar Flat. In the view above, the lighter soil to the right is the remains of the original beach, while the steam shovel is unearthing darker fill near Fremont Street as it digs down to near the high tide line. Below, the same dark patch has now been excavated down to the level of tar deposited by the gas works. To the rear, along First Street, the excavation has cut into the original beach. Note the crushed tank near the drums at center left; it was one of several unearthed in the course of excavating the block.
(both views, CALTRANS Bay Bridge Archive)



yards of fill. The San Francisco City Engineer, in his report of 1854, estimated fifteen and one-half million cubic yards of fill would be required to fill Yerba Buena Cove between the shore and the established waterfront line of the city. He based his calculations on the assumption that an average of twenty-one feet of fill would be needed to completely fill the cove. All of these estimates may be conservative, for when the city sold some of its property in Yerba Buena Cove in 1853, it was covered by twenty-five feet of water at low tide. This meant that thirty-five cubic feet of fill was required to bring each square foot of property up to city grade [1973:47-48].

Problems of Bay Fill

East of First Street, the right-of-way of the Transbay Terminal viaduct is located on what was once open water, as can be seen on the 1852/53 Coast Survey Map, and the cover plate. Filling began in this area as early as 1850, but was not completed until the late 1860s. Filling was mostly undertaken by private lot owners, and at first consisted of sand from sand-hills west of First Street. Later, fill of unknown origins, including local refuse was used, including waste from businesses built on piles. Much of this refuse would have consisted of household garbage, and spoiled goods from arriving ships that would have been dumped off wharf facilities directly into the bay below. This type of waste fill may be presumed to be largely non-hazardous or non-persistent. In addition, research has shown that several ship repair and boat building enterprises were located directly in or near the project area. Their operations depended on access to the water, and their wastes--such as paint, varnish, and coppering materials for hulls--would have a high probability of ending up in the bay on or near the project area. Wastes of the types discussed above may be found mixed with conventional bay fill throughout the filled area of downtown San Francisco, and so do not present a special hazard to the site of the Transbay Terminal and its viaduct structures.

Of greater importance are large-scale industries, such as the San Francisco Gas Light Company Works, in operation on Block D from early 1854, and with expanded facilities on Block C and Block 4 dating from the late 1850s and early 1860s. Substantial amounts of coal tar waste were discharged from the gasworks onto the portion of the Transbay Terminal viaduct site that lies west of Fremont Street, and onto unfilled portions of the site of the terminal's East Unit. The slow process of the filling of Yerba Buena Cove involved the construction in the 1850s of substantial deep-water wharves near the present line of the Embarcadero. Behind these, unfilled areas remained mudflats and waste repositories in the 1850s and 1860s, giving the district the name "Tar Flat."

I: The San Francisco Gas Light Company Works, 1852-1896

The Original Gasworks Site, Bounded by First, Fremont, Natoma, and Howard Streets

The impetus to establish the San Francisco Gas Light Company arose from the nocturnal disorders that disturbed the safety of the streets of Gold Rush San Francisco. Travelling the darkened streets was considered dangerous by many; the innovation of gas street lighting was greeted as a solution to crime. Peter Donahue, having already amassed considerable wealth through his pioneering iron foundry at the northwest corner of First and Mission streets, obtained a street lighting franchise in July of 1852 from the city government in exchange for promising to build a suitable plant to produce gas from coal: supplying gas for the street lights at a high fixed rate ensured the financial success of the venture. By 1852 coal gassification technology was already well established in Europe, and was rapidly spreading throughout larger eastern American cities. No such gasworks had then been built west of Saint Louis; Peter Donahue knew nothing about gas technology, and there were no experienced gas experts in San Francisco.

Peter Donahue recruited W. W. Beggs, a young engineer from the East Coast, to study current gasworks technology, and design and supervise the construction of the new San Francisco gasworks. Although most histories have credited Donahue for the gasworks, he had little to do with the technical matters involved. Beggs continued to run the works for many years after their completion, while Donahue provided capital and political influence, while receiving profits both from the operations of the gas company, and, more significantly perhaps, by selling the company almost all of its equipment, which was produced at the Donahue foundry. In an unpublished manuscript from the Bancroft library, Donahue's secretary, Joseph Eastland, reveals this side of the gaswork's history:

I remained with [Union Ironworks] as their book keeper until I went to the Gas Company, and was elected Secretary of that concern, in January 1856. Thus I was connected with the Gas Works from its inception. The building of the Gas Works was a very profitable enterprise for the Donahues, involving a large amount of work for the foundry, and also the building of the works. We had to order pipe from the east. . . . All the work was done in the foundry. We had a great deal to do with building the Gas Works, and it was very profitable work

for the brothers Donahue. They were large owners in the Gas Company and also proprietors of the shop that did the work, so they made an immense amount of money. . . .

The building and successful completion of the Gas Works, however, was chiefly due to a gentleman not mentioned in Donahue's *Life*, but who should have been; that man was W.W. Beggs. . . . When Peter [Donahue] went East to get the machinery for the Gas Company he found this man Beggs, whom he had known when a boy [while working for Beggs' father], engaged in erecting gas works in a town in New Jersey. This young Beggs was a remarkably able man in every way, as architect, engineer, etc., and Mr. Donahue brought him out here. He built the Gas Works--designed and built them, and ran them for 17 years. He was there as engineer. When he died he was succeeded by his brother, James Beggs, who died and was succeeded by young Crockett, who is there now. Beggs is the man entitled to all the credit for building the gas works and starting them [Eastland MSS:NP]

The site selected for the gasworks occupied all of the portion of Block D south of Natoma Street. A tract 275 feet by 137 1/2 feet, bounded by First and Fremont, Howard and Natoma Streets, was purchased for \$22,000 (Coleman 1952:12). This location had many advantages: it was close to Donahue's foundry, greatly reducing the difficulties of transporting heavy equipment from the foundry to the works; its position along the shore allowed direct water-borne shipments of coal, much of which initially came from collieries near Newcastle, New South Wales; it was near the downtown district of San Francisco in a place that could be seen, at the time, as a central point for the developing metropolis. As well as providing light for city streets and private businesses, the gas works supplied the private dwelling of the well to do, located in large part on nearby Rincon Hill just a few blocks to the south. The short distance made the extension of costly gas mains to a purely residential neighborhood economically feasible; Rincon Hill was rapidly becoming, in 1854, the most fashionable neighborhood in the city. Its residents could afford to pay for gas lighting, and included many of the most influential people in California, including the Donahue family.

The 1852/53 Coast Survey shows the gasworks site as partly submerged under Yerba Buena Cove towards the alignment of Fremont Street, and partly occupied by the edge of the Howard Street sand ridge. Construction began in November of 1852, but filling and grading may have already begun earlier that year. Certainly, preparing the site for the gasworks was one of the largest single earth-moving operations carried out in San Francisco up to that time. Fill almost certainly came from the Howard Street sand ridge and smaller nearby sand dunes; the fill was undoubtedly mixed with rubbish and

miscellaneous materials, but probably did not include rock from Rincon Hill or building rubble.

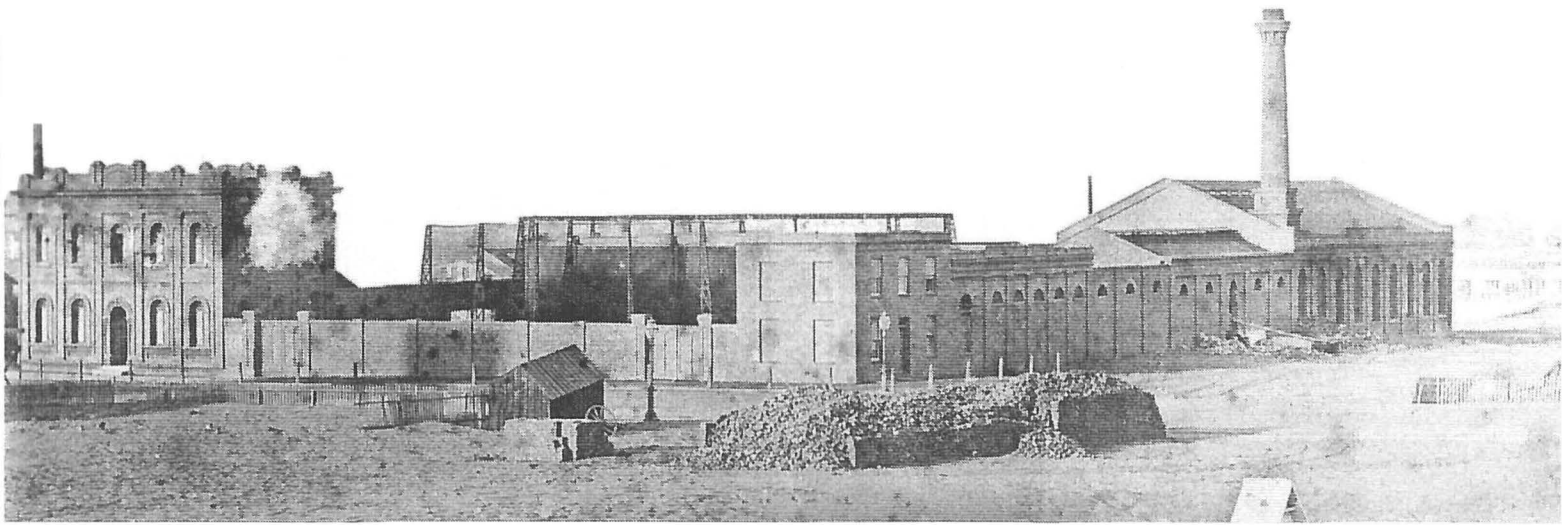
The buildings built for the gasworks in 1853 were of unusually sturdy construction; all were built of brick, and as can be seen in Plate 3, the buildings were more than merely utilitarian structures. Instead, the gasworks had considerable architectural pretensions for an industrial building in the San Francisco of the early 1850s, with carefully executed brick detail work, rows of imposing arches, and impressive facades along First and Howard streets. Subsequent additions continued the same architectural themes; it is quite likely that W. W. Beggs was responsible for the architecture, as well as the technical design, of the gasworks. A comparison of Plate 3 with other views and the 1887 and 1899 Sanborn maps shows few changes in the external appearance of the gasworks buildings over the passage of time, even though many internal technical changes were made.

The original gasworks complex was designed as an enclosed quadrangle, built around an open yard that contained the central gas holder and a smaller, auxiliary holder, as can be seen on Plate 4 and on the 1887 Sanborn Map of the block. Offices and maintenance facilities filled two-story buildings facing First Street, while the main retort house was built at the corner of Howard and Fremont, on filled land adjacent to Yerba Buena Cove. Along the entire frontage of Howard Street, the retort house, purifying house, and repair shops formed an unbroken row. All of these buildings were constructed directly along the surrounding streets; to complete the quadrangle design, intervals between buildings were filled with brick walls as high as 15 feet. Why the works were so expensively built in a manner resembling a fortress is a matter of some historical interest. It is possible that pride in technology may have played a part; it is likely that Peter Donahue had a financial interest in a brick kiln.

The *Daily Alta California* published a detailed account of the gas works on February 21, 1854, shortly after their opening:

We yesterday took occasion to visit the Gas Works and to inquire into the method of making, purifying, and confining the gas, preparatory to sending it throughout the city to be used in the streets and houses. The coal used is bituminous or cannel--at present they are using cannel coal.

The first apartment is the Retort House. This contains a large structure of brick in which are distributed twenty-one retorts of cast iron. Each retort is about eight feet long, a foot and a half wide, and a foot thick. These retorts are filled with coal, then a very hot fire is kindled beneath them and the gas passes



Plates 3 & 4: The San Francisco Gas Works were nearing completion on newly filled land when the picture above was taken in 1853, looking north towards the corner of First and Howard. At the right is the retort house with its tall chimney; at the far left are the company offices at First and Natoma, with the giant gas holder in between. Below, the gasworks appear in an 1857 view between the iron foundries of First Street, on the left, and the still open waters of Yerba Buena Cove, seen above the retort house and at the far right. By then, the whole district was already known as "Tar Flat." (above, *California Historical Society*; below, *courtesy of the Bancroft Library*))



off through a pipe at the top. About four hours of white heat in the retort are necessary to drive all the gas from the coal.

The gas is conveyed into a large pipe, called the hydraulic main, to the Purifying Room. In the purifying room the gas is forced by the constant increase from the retorts to pass through water in which it deposits the remainder of its tar and some ammonia which escaped from the hydraulic main in which the gas is still warm. After passing through a number of pipes the gas, not yet pure, is admitted in large purifying boxes where slaked lime is kept upon shelves, and lime absorbs the sulphur and carbonic acid gas, and leaves the gas sufficiently pure for use.

From the purifying room the gas passes to the Reservoir or Holder. Imagine a brick cistern 60 feet in diameter and 20 feet deep without a top. Then think a sheet iron tub about 2 feet less in diameter sitting inside the cistern bottom upwards. That is the Gas Holder. In the bottom of the cistern is water, and the gas passes up through it into the tub, which rests upon the water and is held up by the gas within; and the more gas inside, the higher rises the vast tub, and when there is no gas, the tub rests flat down on the water. This tub or holder is made of sheet iron, supported by a wrought iron frame work, and its weight is the force which drives the gas throughout the city.

The holder has a capacity of 35,000 cubic feet, and 50,000 cubic feet might be made by the works in 24 hours. To make 50,000 feet, about 6 tons of first rate coal is necessary, and after the gas is extracted from the coal, there remains in the retort a substance resembling charcoal called coke. It is nearly all carbon and makes an excellent fire. The coke, after being taken from the retorts, is used in the furnace to drive the gas from other coal, so that the establishment is at no expense for fuel after purchasing its coal from which the coke is made.

This account from the *Alta* is the only known reasonably accurate description of the gasworks during its first years of operations. It allows buildings shown on the 1887 Sanborn Map to be identified. The retort house, located at the corner of Howard and Fremont, had been converted to storage by 1887, with the exception of its tar kettle; what the *Alta* refers to as the "Purifying Room" actually consisted of several chambers ranged along Howard Street, where successive purifying operations were performed. The first of these, labelled "Ammonia Mfg." on the 1887 Sanborn Map, was where the first stage of the purifying process was carried out, with gas from the retorts passing through water to remove tar and ammonia. Beyond this a building labelled "purifying" on the 1887 Sanborn Map is where the final stage of the process took place, with the cooled gas passed through boxes filled with slaked lime, which absorbed the sulphur and carbonic acid.

The one point where the *Alta* account differs significantly from the 1887 Sanborn Map is in the size of the gas holder; instead of a diameter of 60 feet, the 1887 Sanborn Map shows a 90-foot diameter holder. The solution to this discrepancy can be found in Plate 4, showing the large gas holder still in existence in 1887, with the framework of a smaller gas holder in front and to the left of it. This smaller holder also appears on the 1857 Coast Survey; it was located near First Street and appears to have been the holder referred to in the *Alta* article. By 1887, it had been filled in, and its site was shown as an open yard on the Sanborn Map. The surrounding wrought-iron frameworks of the two gas holders, as seen on Plate 4, appear to be of roughly similar height; thus, both would have required water cisterns of equal depth. The 20-foot depth mentioned by the *Alta* accords with visual sources and was within the range typical of contemporary gasworks technology.

Expansion of the Gasworks across Fremont Street to Block C

The demand for gas lighting soon outgrew the capacity of the original gasworks facilities. The official PG & E Centennial History includes figures of the expanding demand for gas:

In 1854, the first year of operation, there were 237 customers; 563 the next year. By the end of 1855 more than 6 1/2 miles of pipe had been laid and 154 street lamps were in operation. capital stock authorization was raised from \$150,000 to \$450,000 in January 1854; to 1,000,000 in 1855; to \$2,000,000 in 1862; to \$6,000,000 in 1866; and to \$10,000,000 in 1873 [Coleman 1952:15].

The expanding capitalization was not necessarily, however, accompanied by physical expansions of the gasworks plant. At some point, a large new retort house on Block C was built; written sources, including the PG & E official history, mention the expansion, but are vague about when it took place:

The Howard Street plant had been in operation scarcely more than a year when it became necessary to enlarge its production and storage capacities. When the plant was first placed in commission, it could send out only about 70,000 cubic feet of gas daily; its two small storage holders had a total capacity of only 160,000 cubic feet. . . . To meet the upsurging demand, additional retorts were installed, and in 1860 two steel telescopic gasholders were erected at Fifth and Howard streets [Coleman 1952:26].

An 1856 Fardon view of Tar Flat shows that no substantial buildings had yet been erected on the eventual site of the new retort houses; the 1857 Coast Survey confirms this and also shows that much of Block C remained unfilled at that time. Gifford's very accurate 1864 bird's-eye view of San Francisco shows a new retort house on Block C that corresponds to the dimensions and location of the retort house shown on the 1887 Sanborn Map of the block.

A large, new gasworks structure on Block C is plainly visible on a little-known daguerreotype view which has been dated to 1856; this view appears on the cover of the earlier *Tar Flat* study and also as Plate 6 in that report. The new building shown in that view closely resembled the original retort house across Fremont Street; no particular expertise is needed to discern the similarity between the two buildings in their external arrangement of bays, brick construction, and architectural style. A close examination shows that the architectural details of the two buildings were identical, with pilasters dividing arched bays of size. The original retort house had 9 such bays, and the newer structure, 11 bays. Since the 1887 Sanborn Map shows that the original retort house was approximately 105-110 feet long (9 bays, each 12-feet in width, comes to 108 feet), the new building on Block C measured approximately 132 feet in length, with its width similar to the that of the first retort house. Certainly, this was one of the larger and more substantial buildings in the San Francisco of the 1850s. It was the only permanent structure on Block C at the time the view was taken.

When this daguerreotype view is compared to all other known visual sources for Block C, including the 1887 Sanborn Map, the building described above is not to be found. Instead, the available visual sources from the early- to mid-1860s clearly shows a pair of buildings that also that appear on the 1887 Sanborn Map, one of which was a retort house, and the other a coal storage facility. This pair of buildings occupied the same general site as the structure that appears on the late-1850s view, but while the long axis of that structure paralleled Howard Street, the buildings shown on the 1887 Sanborn Map and the 1864 Gifford view were oriented along Fremont Streets.

Thus, a new brick retort house was built along Howard Street circa 1856-1857. Then it was either demolished or moved, and by 1864 the pair of buildings shown on the Gifford View and the 1887 Sanborn Map were built on its site, but oriented at a 90 degree angle to the earlier building. How and why this expensive change took place remains a mystery.

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The Gasworks and the Origins of Tar Flat

Prior to the construction of the gasworks, the shoreline of Yerba Buena Cove on the Transbay Terminal site was rich in edible marine life, but the discharge of tar, which unlike coke had no economic value at the time, soon led to the disappearance of the mussels for which the area was known. According to E. G. Fitzhammon (compiler), "The Streets of San Francisco, Tar Flat," *San Francisco Chronicle*, 1928:

Coal tar was waste and a nuisance in those days, its valuable byproducts not having been discovered. The gas company had to get rid of it in some way. So, ignoring protests from the good folks that were wont to gather cockles, and by dint of a little "fixing" at the City Hall, a large pipe was laid from the gas ovens at Beale and Howard out into the shallow tidewater only a block away.

Thus the coal tar liquid was pumped almost incessantly over the cockle beds, which promptly were ruined and soon passed away.

As the heavy black stuff sank and accumulated at low tide, a tarry area was gradually created. In disgust, fishermen and other folks gave it the opprobrious name of **Tar Flat**. And as such it was known through all those years until the bay was filled in as far as East street (the Embarcadero.)

Fitzhammon's recollections dated back to the 1870s; by then, the retort house ovens had been moved to one of the pair of large brick structure built on Block C prior to 1864; the new retort house was near the corner of Howard and Beale that Fitzhammon's account refers to.

With the expanded facilities of the new retort house on Block C, the capacity of the works remained the largest on the Pacific coast through the 1880s. By then the gasworks could produce up to 70,000 feet of gas per day from about eight tons of coal (Hittell, 1882:733). During the same period, profitable uses for coal tar were developed, and several specialized industries that depended on a steady supply of tar located on Block C, including a company that produced iron piping that was sealed with a patented tar mixture. Other uses for tar included roofing and street paving.

Although industries did find uses for the waste tar that the gasworks produced, it is not known whether these industries could consume all the tar the works produced. Therefore, although February, 1854 marks the beginning of the gasworks tar discharge, the date of its ending can only be dated with certainty no later than 1891, when the gas works were closed down and partially demolished.

It might reasonably be expected that considerable amounts of tar may remain dispersed or stratified on the Transbay Terminal site, especially on Blocks C and D,

including tar spilled onto the ground by the industries that received it directly from the gasworks.

Direct discharges onto the area east of First Street that is traversed by the Transbay Terminal viaduct dated from the period between 1854 and the late 1860s, when filling of that area was completed. East of Main Street, tar dumping continued into the 1870s. Roxburgh describes the extent of tar pollution as late as the period of 1875-1880 in his recollections in the *South of Market Journal*, published in 1933:

Between Howard and Folsom was Adams & Blinn's lumber yard [at Steuart Street]. Next to them was the shipyard of Middlemas and Boole, who built many vessels at this yard. Here many boys used to swim and get full of tar that came from the gas house at First and Howard. Now and then some boy would fall in the water fully dressed. Soaked to the skin he would walk up to the gas house to get his clothes dry.

It would appear that by the 1870s the gas works had extended its outfall pipe to keep pace with bay filling, as Roxburgh describes:

The way that Tar Flat got its name was like this: The Gas Company, at First and Howard in making gas used coal, and one of the byproducts was coal tar, and as the company had no use for this tar they had to get rid of it, so they built a pipe line from the gas house to Spear and Howard. There being an empty lot with a deep depression in it opposite the California Planing Mill, into this depression the tar was emptied. It was this spot that attracted the boys of the flat, who amused themselves by poking long sticks into this liquid mass, seeing who could get the most tar upon the sticks they held. Now and then some kid would go home with tar upon his hands and clothes, much to the mother's disgust.

The necessity of having to extend the tar discharge pipe as far as Spear Street is a measure of the extent to which the gasworks, originally located on the waterfront at the edge of the city, became engulfed by urban development. By the mid-1870s, the entire area surrounding the gasworks was devoted to industrial and commercial use, and the works themselves were approaching technological obsolescence.

The reason for this obsolescence had nothing to do with the production of hazardous tar wastes, but lay in the fact that the use of coal for gas production was expensive in California because of limited local coal mines worked by expensive local labor, mainly near Mount Diablo. With the beginnings of the petroleum industry in the later nineteenth century, attention turned to producing gas from this much cheaper and more abundant

source. Gas companies, including the San Francisco Gas Light Company, which had much of their capital invested in coal distilling apparatus, viewed this new trend with dismay, especially since petroleum gassification plants were small and designed for individual household or industry use. The San Francisco Gas Light Company went so far as to distribute circulars to its customers to try and dissuade them replacing its services with their own gassification machines. Although the original circular has not survived, the prominent engineer J. W. Stow's response provides us with an explanation of why the gasworks on Blocks C and D were eventually closed:

The attempt to produce gas from petroleum is no new thing. Scores have tried, only to fail. The great difficulty which has always been encountered in the efforts to manufacture illuminating gas from the liquid hydrocarbons is the deposit of free carbon in the retorts and pipes, making the process impracticable, no matter what appliances were used. In this fact is found the cause which has compelled the successive abandonment of every device resorted to during the many years over which the experiments in this direction have extended. So many and so discouraging have been the failures in the past, that men skilled as gas engineers hesitate to believe that *any* method can be devised which shall make that *possible* which has hitherto proved an *impossibility*.

Still, few things that are really necessary are found to be impossible; and it is now definitely determined that illuminating gas of superior quality *can* be produced from petroleum, and upon the most extensive scale. And it is also found that this is not only possible, but that gas can be produced at so low a cost that coal gas companies *cannot hope to compete* with those using petroleum as the basis of their operations. It is natural, therefore, that such companies should struggle earnestly to maintain the position which they have attained--the more so as they see so formidable a rival rising up to contend for the field they have hitherto monopolized. [J.W. Stow, Reply to the San Francisco Gas Company's Circular about Petroleum Gas, 1871: 3-4]

By 1890 a new gasworks, capable of using either coal or petroleum as raw material, was under construction in the Marina District; when it came on line in 1891 the gasworks on Blocks C and D ceased operations. The property on the Transbay Terminal site was sold at auction in 1896, and most of the brick buildings were adapted to other industrial uses, which are discussed in Chapter II. The gas holder cistern on Block D was filled in; another had already been abandoned and filled in prior to 1887. No buildings constructed on the site of these cisterns since 1891 are known to have had basements. It is therefore possible that significant portions of both cisterns remain in place underneath Block D in 1993.

Most of the original brick walls of the gasworks, dating back to 1853, definitely survived the 1906 fire, and are noted on the 1913 Sanborn Map as "old walls," often incorporated into post-fire buildings. In some cases, it would appear that the 1853 structure was merely gutted in 1906, and then roofed over and rehabilitated. The lot lines and external walls of several structures still standing in 1993 on Blocks C and D correspond to the external walls of gasworks buildings dating to 1853 and to the 1860s, and shown on the 1887, 1899, and 1913 Sanborn maps. It is therefore possible that significant portions of gasworks structures still exist above the ground, unknown to historians and archaeologists.

Block C: Bounded by Mission & Howard, Beale & Fremont Streets

Summary

Originally part of the shallows of Yerba Buena Cove, Block C was filled for industrial sites during the mid-1850s to mid-1860s. By ~~the~~ 1868, however, the section of the block now covered by the footings for the East Unit of the Transbay Terminal and its approaches had become the site of a major iron foundry, the Vulcan Foundry, which had moved from its earlier site on Block D where the Transbay Terminal Center Unit now stands. At the same time, the expanding San Francisco Gas Light Company constructed its new Retort House and coal storage facilities on the southern third of the block, while smaller foundries and boiler works occupied sites on the northern third of the block.

In the mid-1890s, the gas works were shut down and its site used for a coal yard, a sash-and-blind factory, and several machine shops. After the 1906 fire, which destroyed or gutted all the buildings on the block, it was rebuilt with office buildings on its northern third, and consumer goods warehouses, machine shops, and a copper works on its southern two thirds.

The potential for historic hazardous materials contamination from industries on the block consists in tar discharge from the San Francisco Gas Works during the period from 1854 through the early 1860s; hydrocarbon contamination from operation of the Retort House facilities and adjacent industries that used waste tar, dating from the early 1860s through the early 1890s; and contamination associated with iron foundries, boiler works, and machine shops.

North of the Transbay Terminal East Unit structure, several brass works and an asbestos supply company were located on a site near the corner of Mission and Fremont; this property was vacant in 1993. The potential for post-1906 historic hazardous materials contamination may be greatest near the corner of Beale and Howard, the site of a copper works.

Natural Site

On the 1852/53 Coast Survey Map, Block C is shown as part of Yerba Buena Cove; the water was one to two feet deep at mean low tide, with a sand or mud bottom, making

the site useful for some maritime activities, which continued through the early to mid-1850s. Daguerreotype views taken at that time show numerous shallow-draft vessels moored near storage sheds located north of Mission Street. Filling operations on Block D, undertaken in 1852 for the construction of the San Francisco Gas Works, did not extend across Fremont Street. Plate 3, the first known view of the gasworks, shows tidelands just beyond the retort house at Howard and Fremont. Visual sources dating from 1854-1855 continue to show Block C as unfilled during that period.

Plate 4, taken in 1857, shows open water near Fremont and Howard streets, while the remainder of Block C which is visible in the original daguerreotype view does not reveal any structures of note, except for a frame shed structure near the corner of Beale and Mission streets. Map 3, the 1857/59 Coast Survey, is consonant with the photographic evidence. By the time the map was surveyed, the shed structure mentioned above had been built near Beale and Mission, while Beale Street itself had been partially filled south of Mission, leaving a large, landlocked residual pool that stretched from Beale to the corner of Fremont and Mission. Map 3 also shows that the filling of Block C was carried out by individual owners of 100-vara lots, three of which had been filled by 1857, with the edge of fill confined as closely as possible to property lines. The Transbay Terminal East Unit stands on two of these lots. The fact that both of these lots are shown without buildings on the 1857/59 Coast Survey and on Plate 4, suggests that they had been recently filled in 1857. Until the late 1850s, the demand for lots filled to city grade, and the high cost of filling, ensured that such properties did not remain vacant for long.

Industrial Development, 1857-1906

An examination of all industrial businesses listed in the 1859 San Francisco Directory does not reveal any located on Block C. Subsequent business directories through the mid-1860s are likewise devoid of Block C industry listings. The most likely land use during this period was for outdoor storage of bulk materials, such as coal awaiting use at the gasworks. A detailed 1864 bird's-eye view confirms the absence of industrial activity (apart from the expanded San Francisco Gas Works) during the early 1860s, with only a few small structures shown along Fremont and Beale streets near Mission.

The expansion of the San Francisco Gas Works from its original site on Block D to include the southern third of Block C was in contrast to the lack of industrial activity on the northern two-thirds of the block during the early 1860s. Precise dates for the

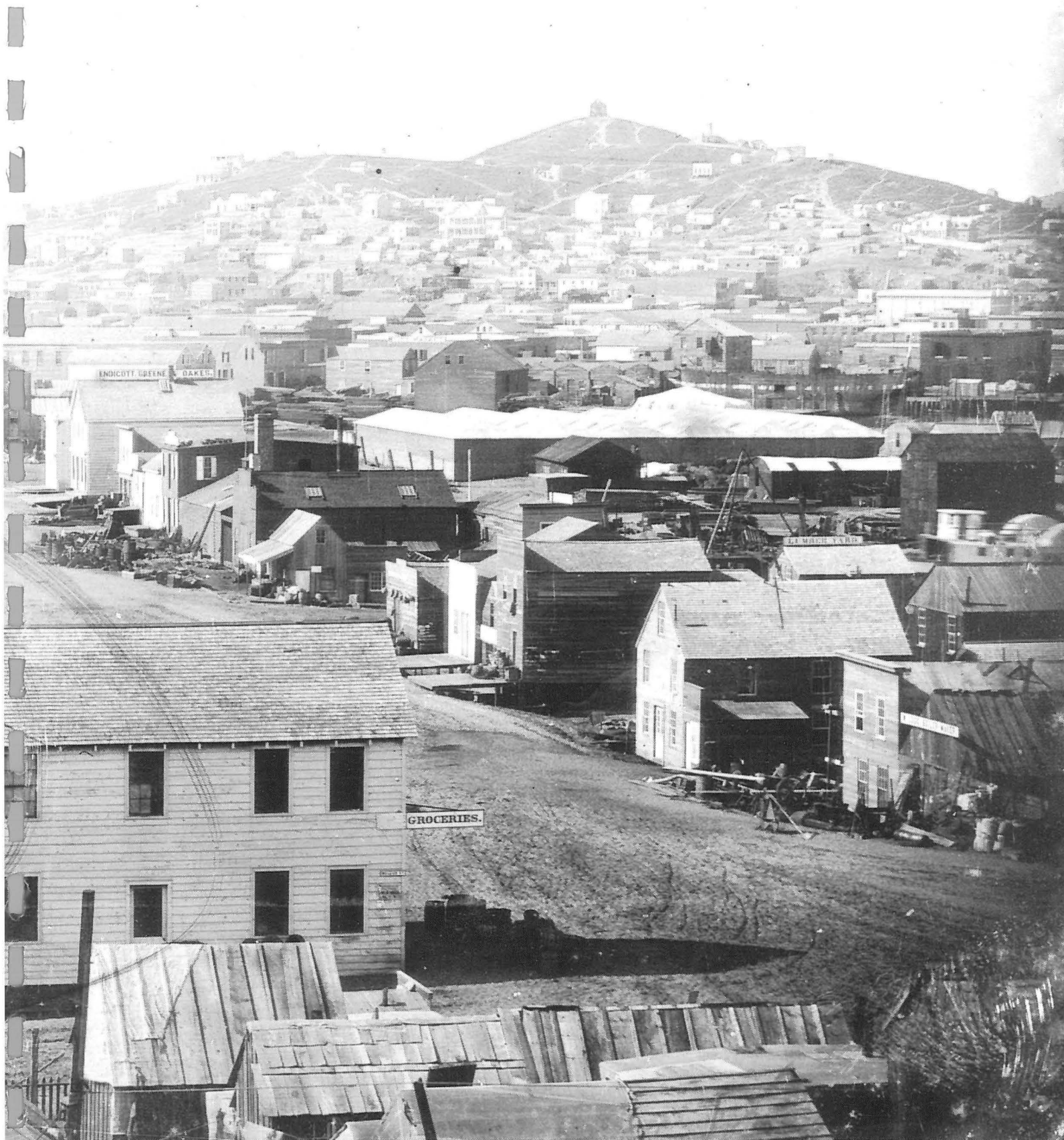


Plate 5: Looking up First Street in 1851, the daguerreotypist recorded the beginnings of the ferrous metals industries on the Pacific Coast. Note the double-wheeled ferryboat at the far right; it is floating near the corner of Fremont and Mission Streets. Yerba Buena Cove lies just beyond the machine shops, boiler works, and the small foundries that line First Street.
(Courtesy of the Bancroft Library)

several phases of expansion cannot be precisely ascertained (PG&E is only certain that the expansion took place sometime before 1887), but the 1864 Gifford bird's-eye view clearly shows large, twin brick structures on Howard Street that also appear on the 1887 Sanborn Map as the retort house and coal house of the gasworks. The fact that the San Francisco Gas Light Company undertook a major expansion of its capital base in 1862 suggests that the expansion of the works took place during the 1862-1864 period.

Apart from the gasworks, business directory research shows that the major phase of industrial expansion on Block C took place between the late 1860s and the mid-1870s. Most of the industries shown on the 1887 Sanborn Map had been established by 1875.

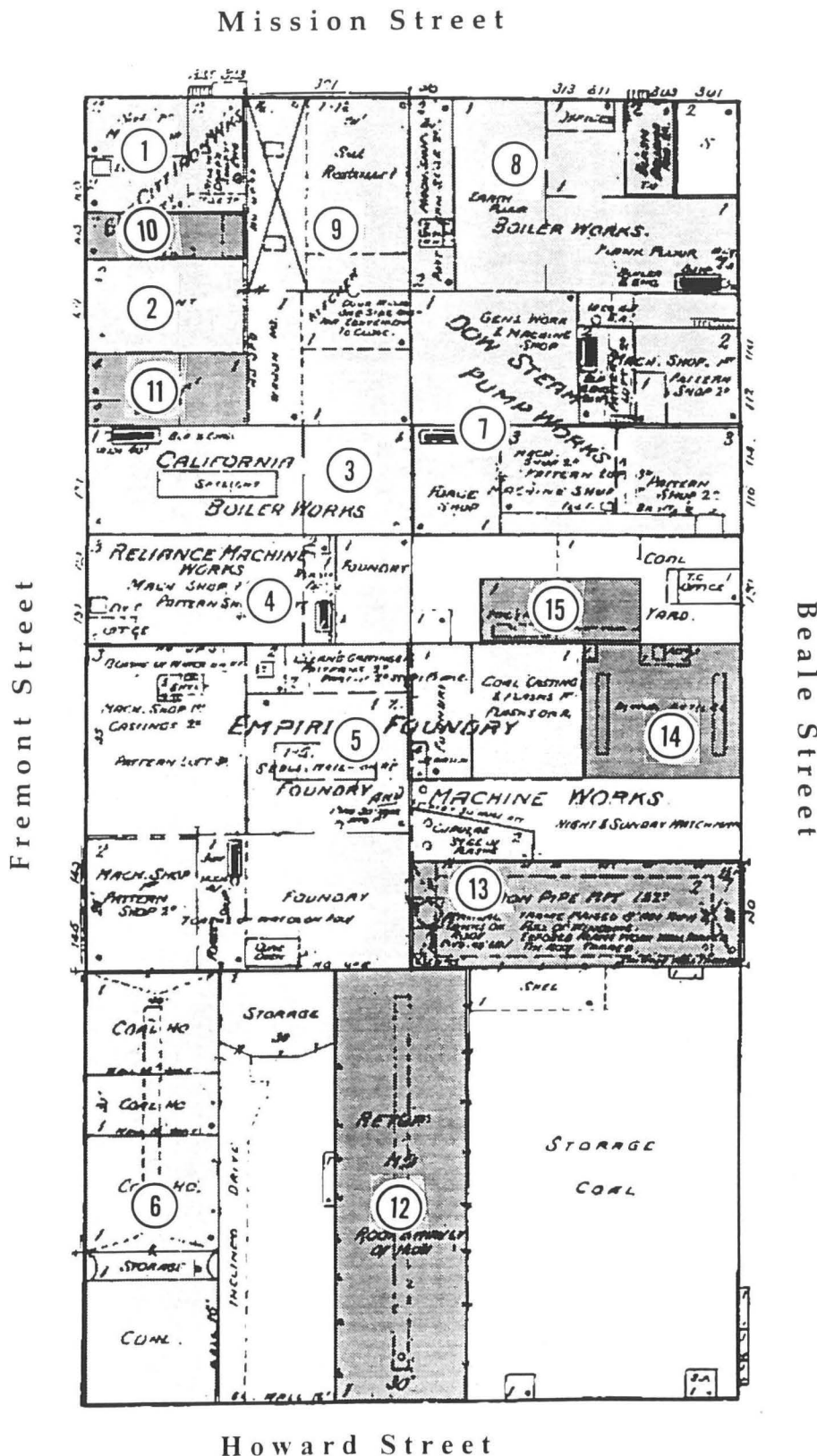
At the corner of Fremont and Mission streets, with street addresses of 123-125 Mission and 103-107 Fremont, a two-story structure that extended 110 feet south along Fremont Street and 55 feet east on Mission housed several iron works, machine shops, and other metal-working operations from the early 1880s up through the 1906 fire. The first recorded tenants of the building (apart from a corner saloon that dates back to the early 1870s) appear in the 1883 directory: the Western Ironworks, also known as Bigelow, Sims, and Morris.

The Western Ironworks was one of the longest enduring foundries of Tar Flat; established in 1878 on the east side of Beale Street, it was still in business in 1929. Unlike the general-purpose iron foundries that were characteristic of Tar Flat during the 1880s, Bigelow, Sims, and Morris specialized exclusively in iron fixtures that related to building safety and security. The firm was best known for its safes, which were among the best available. Iron shutters and doors probably formed a bigger portion of its business, however; virtually all masonry warehouses and many general commercial buildings were fitted with specialized fireproofing shutters in an era when fires were frequent and hope of protection was worth a considerable investment in the latest fireproofing technology. Both lines of work were combined in the elaborate iron jail and prison cell structures that Bigelow, Sims, and Morris manufactured and installed for various county jails and Folsom Prison.

The Western Ironworks operations on Block C appear to have been an annex to its main premises a block away. Nevertheless, this corner structure included a core oven, located approximately sixty feet back from Fremont and Mission streets.

Between 1884 and 1887 the Bigelow, Sims and Morris partnership split, with Bigelow remaining as the main tenant of the corner of Fremont and Beale. The firm's new name was the Bay City Ironworks. Despite its name, the successor firm was not an iron foundry and did little heavy iron work; on the 1887 Sanborn Map the core oven is

Map 3: 1887 Sanborn Map of Block C:
Bounded by Mission & Howard, Fremont & Beale Streets



Key to Historic Potential
Hazardous Materials Sites

Ferrous Metals Industries
Shaded in Light Gray:

- 1: Western Ironworks;
Bay City Ironworks
- 2: Ohmen Engine Works
- 3: California Boiler Works
- 4: Reliance Machine Shop
- 5: Vulcan Foundry;
Empire Foundry
- 6: Gasworks Coal House;
after 1896, the site of
Machine Shops
- 7: Dow Steam Pump Works
- 8: Portland Boiler Works
- 9: Blacksmith/Machinists

Non-Ferrous Metals and
Hydrocarbons Industries
Shaded in Dark Gray:

- 10: Union Brass Foundry
- 11: Bronze Works;
Asbestos Supplies
- 12: Gasworks Retort House,
1860s-1891; After 1896,
Iron & Steel Supplies
- 13: Francis Smith Pipe Works
& Oil Products
- 14: Pipe Works' Tar Kettles
- 15: Tar Melting Kettle

listed as "not used". Instead, the Bay City Ironworks was more properly a machine shop and a maker of smaller metal fixtures, notably gas stoves, which were produced on the second floor of the building.

During the early 1890s the Bay City Ironworks continued to occupy part of the building, while the central portion at 105 Fremont, including the core oven, became the home of Giovanni & Co.'s Union Brass Works, a small general brass foundry. Adjacent to it, at 107 Fremont, W. H. Ohmen operated a machine shop. By the mid-1890s, the Bay City Ironworks had vacated the building together with most of its other tenants; by the time the 1899 Sanborn Map was surveyed, most of the building was vacant, except for a small machine shop on part of the second floor, and the ubiquitous corner saloon. In the early years of the 20th century, the portion of the structure at 105 Fremont housed the M. Pickthall lubricating oil business, which sold lubricating oils to the many nearby machine shops. The Thompson Company machine shop shared the building, with an address of 107 Fremont.

The site immediately adjacent to 107 Fremont was occupied by a residential or other non-industrial structure up to the late 1880s; probably, this four-story building, shown as vacant on the 1887 Sanborn Map, had been built in the 1860s as a boarding house. Replaced by a one-story structure with a street address of 111 Fremont, the site became the home of a number of metal-working industries in the 1890s, including J.F. Russell's blacksmith shop; the Renaerts & Grim bronze works, specializing in metal plating, including gold plating work; Russell & Edwards, tool makers for artesian well-borers; and the Eureka Machine Works.

By the early-1900s, the bronze works had been acquired by Charles Bartels, who advertized as a brass founder. Bartels shared the building with the Asbestos Contracting Company, which installed asbestos pipe and boiler coverings, dealt in asbestos paints, and asbestos roofing. This company was one of the few asbestos dealers in the city at a time when asbestos was widely coming into use; their location here is probably a function of the many nearby boiler makers, such as the California Boiler Works next door at 125-127 Fremont. Asbestos boiler lagging, for stationary boilers, marine engines, and especially railway locomotives, was a major innovation of the period, and much of the metal working industry of Tar Flat involved general and specialized boiler making and repair, as contemporary photographs of sidewalks lined with boilers graphically documents. Partly because it was a new industrial material, asbestos was not regarded as hazardous in the 19th century, unlike more traditional materials such as lead and arsenic. From its history as a metal plating works, bronze foundry, and asbestos shop,

the 111 Fremont must be considered to have a significant potential for hazardous materials contamination; however, it is not immediately on the site of the Transbay Terminal.

Adjacent to 111 Fremont, at 121-127 Fremont, stood a large, one-story shed structure that appears to have been constructed in the early to mid-1880s. As early as 1875, the site of this building had been occupied by Calvin Nutting & Sons, machinists; but the absence of other tenants and the small size of machine shops during the 1870s suggests that Nutting operated out of an earlier structure that had been removed by 1887. By that year the property was the site of the California Boiler Works, which continued in operation there until 1906. The California Boiler Works was strictly a boiler fabricating and repair shop; there is no evidence that it ever engaged in iron founding. Some indication that it was a relatively small operation may be inferred from the fact that it shared quarters at 121-127 Fremont throughout the 1890s with Joseph Lemmer, who listed himself separately as a boiler maker. The potential for hazardous materials contamination arising from the boiler works is similar to that of a machine shop, with the addition of a possible asbestos hazard.

The lot just south of the California boiler Works, at 129-133 Fremont, later renumbered to 133-139 Fremont, housed machine shops from the mid-1880s through the early 1900s. In 1887, the lot was occupied by a three-story building tenanted principally by the Reliance Machine Works, with the first two floors housing the machines shops, and pattern storage on the third. To the rear was a one story structure housing a foundry, with blacksmith shop and a stationary engine. By 1891 the works had been acquired by the firm of Clot & Meese, while continuing in the general machinist business. By 1898, however, the lot was occupied by the Taylor & Spotswood Company, suppliers of wagon materials and blacksmith tools. The drafters of the 1899 Sanborn Map misread the name of the firm as Taylor & Scott Wood Company--but it seems that Taylor & Spotswood functioned as a specialized wholesale hardware store, only incidentally supplied wooden wagon parts to the blacksmiths who were its major customers.

At some point during the mid-1890s, the building that occupied the site was either replaced or very substantially remodelled; the new building was only two-stories high instead of three, and was a simple truss-roof structure that now filled the whole lot. A comparison of the 1887 and 1899 Sanborn maps reveals that buildings to the south were also replaced or substantially altered during the same period, suggesting that a fire may have destroyed or damaged structures on Fremont Street during the 1890s.

The largest industry on Block C, apart from the gasworks facilities on Howard Street, was a large foundry complex, at different times the Empire Foundry and the Vulcan Foundry, in operation on the site of the Transbay Terminal East Unit from 1867/68 up through the early-1890s.

The foundry complex was built by Joseph Moore, one of the most prominent and inventive of the foundrymen of Tar Flat. Moore had previously been foreman of the Vulcan Iron Works across Fremont Street on Block D, where the Center Unit of the Transbay Terminal now stands. Moore recalled to H.H. Bancroft:

In '58 I joined the Vulcan Iron Works, as foreman, and continued in that capacity for, I think, two years, until the death of Mr. Torquay at which time I was put into the office as general superintendent; where I continued until '67, when I made an effort to start the Novelty Iron Works. . . . We purchased the ground on the east side of Fremont Street, opposite the Vulcan Iron Works, and now known as the Vulcan Iron Works [Bancroft Mss. ND:NP].

Elsewhere in the *Dictation of Joseph Moore* a slightly different account is given:

Then I started about 21 years ago, 1868, the Novelty Iron Works, opposite the present Vulcan Iron Works, with John Young, who was the first manager of the Almaden quicksilver mine. . . . While I was President--I was then President and Manager of the Vulcan Iron Works--I started this place across the street from the Vulcan, on Fremont Street, but just as we had got it started, and fairly underway, Young died, and we sold the whole thing out to the Vulcan Iron Works, and it is now called the Vulcan Iron Works

The complex that Moore built initially only extended as far back as the center lot line of the Block, while occupying a 70-foot frontage on Fremont Street. Machine shops filled the whole of the first-floor Fremont Street frontage, with pattern lofts on an upper floor. The rear half of the lot contained the foundry proper, with a core oven near the south lot line, approximately 195-200 feet north of Howard Street, and set back 70-80 feet from Fremont Street.

By 1875 this foundry complex was known under several names: The Vulcan Foundry; The Empire Foundry, Savage & Sons; and The Globe Foundry. Of these, only the Globe Foundry may have begun as a separate foundry business occupying the southern two-fifths of the complex. The entire complex was later extended through to Beale Street, with the additional space used for two cupola furnaces and an additional foundry area adjoining the original foundry floor; an array of pitch kettles located in an open yard bordering on Beale Street, 250-275 feet south from Mission Street; and open

and enclosed storage for flasks, castings, and coal. An undated description by J.S. Hittell detailed the progress of the works:

Originally established on First Street, the progress of time and increasing patronage demanded more spacious workshops, storehouses, and yards. New buildings were erected, extending from Fremont to Beale streets. The premises now front 137 feet 6 inches on the former and have 275 feet in depth. The company own this property, as well as the lots extending to Mission street. Substantial brick and frame buildings are used for a machine shop, boiler shop, blacksmith shop, pattern, shop, and for casting and storage departments. The offices are on First Street [e.Garratt the previous site of the works on Block D].

It is the intention of the Vulcan Co. to concentrate all their business on Fremont Street, and to dispose of their old premises for other purposes.

Closely associated with the Empire foundry was the Francis Smith Company, whose business consisted of iron pipe making and lubricating oils. Located in a substantial, iron-framed, two story building at 130 Beale, the pipe making plant would appear, from an examination of the 1887 Sanborn Map, to be an integral part of the Empire Foundry/Vulcan Ironworks complex. In fact, the pipe factory predated the foundry, and was operated as a separate business. As Hittell describes:

Francis Smith & Co. of 130 Beale have in operation one of the largest sheet iron and steel pipe manufactories on the coast and do a most extensive business. Their specialty is the manufacture of sheet-iron pipe of all sizes from two to sixty inches in diameter, to be used for all purposes for which pipe may be used. . . . They also manufacture all kinds of tools for making pipe, and furnish iron already cut, punched and joined for making pipe right on the ground where it is to be used. Their pipe is covered with a patented and durable composition of coal tar and asphaltum. This enterprise was founded in the year 1872 by Mr. Francis Smith. . . .

Hittell's account explains the presence of the pitch kettles on the Empire Foundry site immediately adjacent to the pipe factory. Riveted iron and steel piping, in great demand for hydraulic mining operations and irrigation schemes, was commonly thickly coated with tar compounds as a sealant against rust.

The location of the Francis Smith pipe factory is almost certainly related to the use of tar as a pipe covering. The south wall of the pipe factory adjoined the property of the San Francisco Gas Light Company work; the rear wall of the main retort house of the gasworks abutted the back of the pipe factory. Although there is no documentary

Plate 6: The Vulcan Iron Works, established in 1850 at the corner of First and Natoma streets, on a site directly behind the Central Unit of the Transbay Terminal, had moved its operations to Fremont Street when this picture was taken in the mid-1870s. Only its offices remained on First Street at the original foundry site. Railway locomotives, such as the *Calistoga*, shown here leaving the machine shops to be loaded on a ferry for Vallejo, were a thorough test of the ironworkers art. The many brass parts of the *Calistoga* could have been made by one of the many nearby brass foundries, or in a separate brass foundry section of the Vulcan Iron Works. The 1887 Sanborn Map does not show any evidence of brass founding taking place at the Vulcan Iron Works facilities, but by the 1880s the foundry had been acquired by Joseph Savage and renamed the Empire Foundry; the change of ownership may have involved an end to brass founding activities on the site. (Courtesy of the Bancroft Library)



evidence of pipework conveying waste tar from the retort house to the pipe works, such a connection almost certainly existed. What had previously been a waste product of the gasworks now had, by the 1870s, industrial uses. Even the structural framework and the roof of the pipe works building were described on the 1887 Sanborn Map as "well tarred." After the gasworks were closed in the mid-1890s, Francis Smith's pipe works went out of business; the building was acquired by the Risdon Ironworks, whose major facilities were just across Beale Street. The Risdon Ironworks already had a pipe making plant; accordingly, the building was used as a machinery warehouse until it burned in the 1906 fire.

The Francis Smith pipe works were not the only Block C industry to make use of the gaswork's tar. A coal yard occupied part of the lot at 120 Beale in the 1880s, but behind the coal yard was yet another tarring business, with a large tar vat housed in an open-walled shed. Business directory research has not yielded any further information about this location; it is very likely that the tar was not used in manufacturing processes on the site, but was instead sold to roofers, wood-block pavers, and other retail customers. Like the Francis Smith pipe works, the tarring business at 120 Beale came to an end with the closing of the gasworks; by 1899 the tar vat and sheds had been removed and the site was a vacant lot.

120 Beale Street, 185 feet south from Mission Street, marks the north end of the central third of the Beale Street frontage of Block C that was devoted to tar products. The remainder of the block as far as Mission was devoted to metal working industries from the early 1870s up through 1906. The two major industries on this portion of the block were the Dow Steam Pump Works and Evans & Company at 110-116 Beale, and the Moynihan Boiler Works, fronting on both Beale and Mission streets.

Evans & Company began operations in 1875, producing specialized steam pumps for mines and municipal water works; their trade complemented the Francis Smith pipe plant and made it possible for a complete hydraulic system of virtually any size to be ordered and constructed along this single block of Beale Street. As well as custom pumps, Evans had patents on several pumps that he had designed for general use, most notably the Evans Fly-Wheel Steam Pump, used by many smaller mines and irrigated farms. By 1889 Evans & Company had built the pumps for many such systems:

Evans and Co. are manufacturers of steam pumps, steam engines, and all kinds of machinery; they also do pipe cutting and threading and make standard gas and tube flanges, deep well pumps, etc. They made the steam pump built for the Chico Water Works, having a capacity of one million gallons per day, and

also one for the Presidio Water Works in this city. . . . They also supplied pumps for Alcatraz island, the Fajo Mine, Mexico . . . and many different cities in California [Liggett 1889:160:161].

Evans & Company shared manufacturing facilities with the George Dow Steam Pump Works, which engaged in exactly the same business; the two firms may well have been merged at some point, while retaining both names, each of which was closely associated with the particular pump designs of the two men. George Dow advertised himself as an hydraulic engineer, and was one of the most prominent in California at the time:

This business as established in the year 1880 by George E. Dow and L. Goss under the firm name of Goss and Dow. In a few years the style was changed to the Dow Steam Pump Works. Dow is now sole proprietor. He is a manufacturer of the most improved hydraulic machinery, power pumping machinery, compound water works engines, single and duplex, improved compound air compressors, etc. etc. At the Mechanics Industrial Exhibition of 1886 and 87 these works were awarded the goal medal for the best steam pump. The walls of the private office show Dow's many inventions.

These works have a frontage of 75 feet. The machinery is operated by an engine of fifty horse power. A specialty is made of the Dow Steam Pump, which has become a general favorite wherever known. The number of employees is 60 and the payroll amounts to a very large sum [Liggett 1889:118].

Although a forge shop at the pump works is shown on both the 1887 and 1899 Sanborn maps, no foundry furnaces are indicated. Most of the works were given over to machine shops; it would appear that heavy casting, at least, was done elsewhere. The type of potential hazardous materials contamination from the pump works would be similar to that of a general machine shop; the pumps included both iron and brass fittings, and considerable quantities of lubricating oil would have been used. The presence of an open yard; several one-story, wood-frame buildings that probably had earth or wood floors housing the machine shops and forge shop; and the existence of a basement storage area at the south end of the property, pose a higher likelihood of contamination than the typical smaller machine shops of Tar Flat, which commonly operated out of a single floor of a multi-story masonry building.

Adjacent to the pump works, Timothy Moynihan's Portland Boiler Works covered a L-shaped site fronting on both Mission and Beale streets, wrapping around a small corner property that was occupied, at different times, by a saloon, a machine shop, and a blacksmith. The site of the boiler works was occupied, on Mission Street, by a

coppersmith, Neil Williams, in the 1870s, and later a blacksmith and machinist, Charles Oester, who operated the San Francisco Forge Company there through the mid-1880s until Moynihan acquired it; the portion of its site along Beale Street has no documented industrial use prior to 1887. Along Mission Street, Moynihan's Boiler Works consisted of an earth-floored, one-story shed structure that had previously housed Oester's machine shop; Moynihan had four forges located there. The second section of the works, fronting on Beale Street, consisted of a similar one-story building, but with a wood floor, that housed the machine shop and a stationary engine to power machine tools. By 1889, the Portland Boiler Works were a substantial operation:

The Portland Boiler Works were started in 1852, and are at present carried on by Moynihan and Aitken, at nos 311 and 313 Mission Street. They employ from 10 to 20 men, and use up about 30 tons of boiler iron monthly. They have turned out a large number of boilers during the past year. . . . They have sent their boilers to Mexico, Valparaiso, and other places [Liggett 1889:154]

The Portland Boiler works continued in operation on its Block C site through 1906; by then, asbestos boiler lagging was in widespread use.

At 315 Mission, abutting the Portland Boiler Works, a two-story brick building housed the Williams & Orton machine shop from the 1883 through the late 1890s, specializing in wood-working machinery, and steam and gas engines. Williams & Orton also supplied "hydraulic jacks, shaftings, couplings, hangers, cutter heads, saw arbors, emery stands, etc., on short notice at low rates. They are making special efforts in the manufacturing of wood working machinery to supply the constantly increasing demand. Their new patent Pony planing machine, just completed, defies competition" (Liggett 1889:163). Next to it at 317-321 Mission, the Sanitary Devices Manufacturing Company made carpet cleaning machinery in the early years of the 20th century, as well as steam-cleaning carpets on the premises. It shared the building with the Acme Retort Company, builders of gas engine generators. In the 1890s the same building housed a leather belting manufacturing and a machine shop specializing in elevator making and repair.

The Gasworks Site, 1896-1906

The gasworks properties within the study area were sold at auction on May 19, 1896; the property on Block C sold for a total of \$43,500, including the two substantial brick buildings that had been built for the retort house and indoor coal storage. Initial plans

had been to demolish all of the gasworks buildings and sell the land in individual 25' lots; this was partly accomplished on Block C, and the rear section of the retort house and parts of the coal house were torn down.

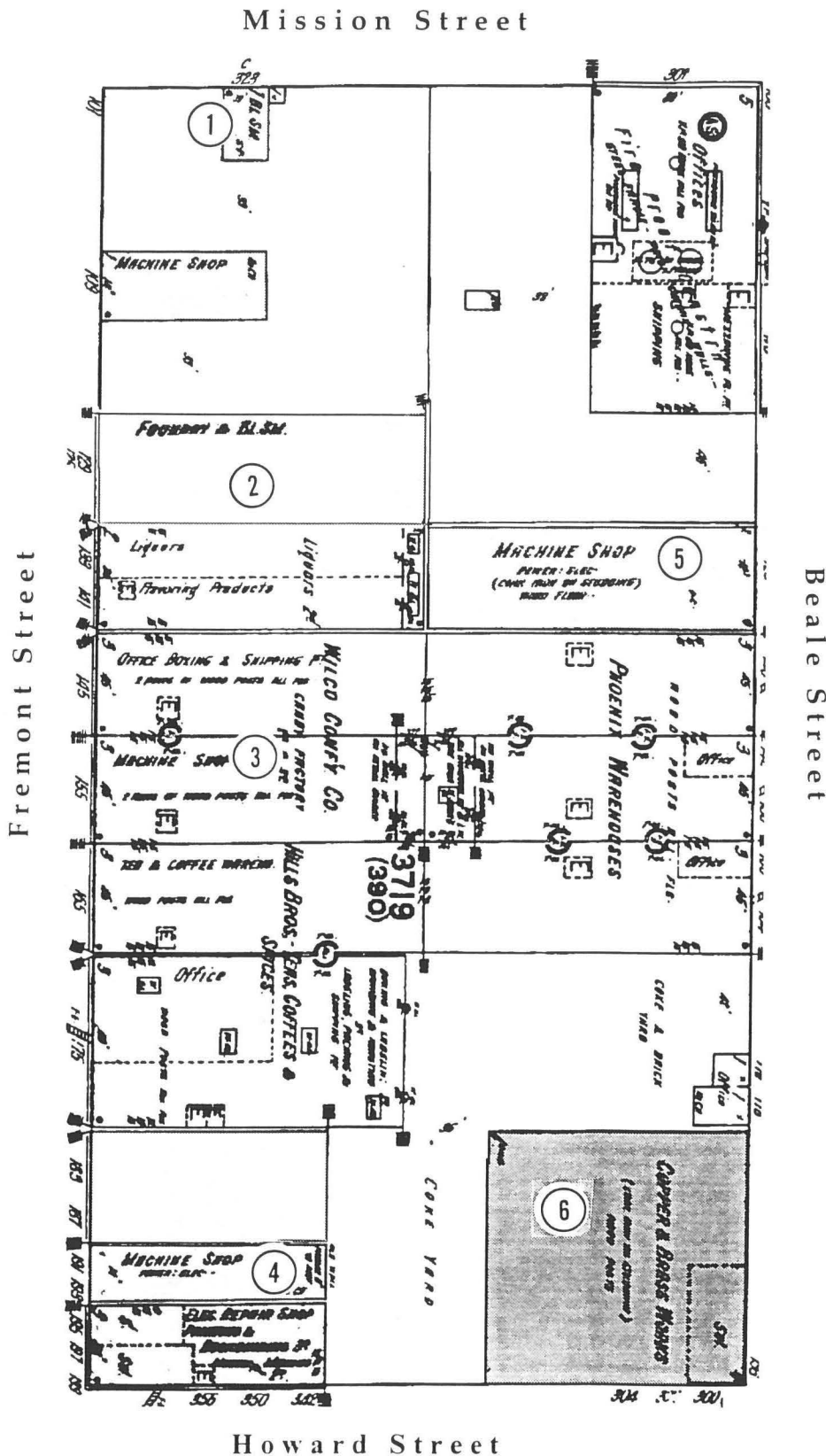
But the demand for smaller industrial sites in Tar Flat was diminishing, and the gasworks sale was not notably successful. The outdoor coal yard of the gasworks, filling a large corner lot at Beale and Howard, remained in use through 1906 as a wholesale coal yard with little change in function or even in the arrangement of several small sheds. The front section of the former retort house, which was not demolished, was divided into two floors. The ground floor was occupied by a supplier of structural steel and iron, and by a pipe threading business. On the new second floor, a manufacturer of blinds and screens for windows continued in business until the early 20th century.

The most substantial changes on the former gasworks site on Block C took place on the site of the coal house. There, the plan to subdivide the land into small parcels was actually carried out, and a row of four two- and three-story brick buildings were entirely occupied by machine shops and boiler makers. These new buildings appear to have incorporated portions of the walls of the former coal house. At 167-178 Fremont, the Meese & Gottfried machine shop carried out general machine work up until 1906. Next to it, at 183-189 Fremont, the C.H. Evans Company, which had previously shared space with the Dow Steam Pump Works on Beale Street, now had its own separate quarters to manufacture pumps and build marine and stationary engines; Evans remained there until 1906. Adjacent to the Evans works, at 193 Fremont, the Christie Machine Works operated a general machine shop from the late 1890s through 1906. The new building at the corner of Fremont & Howard briefly housed the McIntosh & Wolpmann Boiler Works, and later a machine shop.

Industries After 1906

Block C was on the margins of a small area that survived the 1906 fire, and a comparison of the 1899 and 1913 Sanborn maps reveals that the row of buildings along Fremont Street that had been built after the demolition of the gasworks coal house in 1896 survived the fire at least in part, with their brick shells standing in good enough condition to allow for reconstruction. One of these buildings, located at the corner of Fremont and Howard, appears to have suffered little damage in the fire. This building remained standing in 1993, and may incorporate bricks walls from the gasworks retort house dating back to the early 1860s.

Map 4: 1913 Sanborn Map of Block C:
Bounded by Mission & Howard, Fremont & Beale Streets



Key to Historic Potential
Hazardous Materials Sites

Ferrous Metals Industries
Shaded in Light Gray:

- 1: Blacksmith
- 2: Iron Foundry; reinforced concrete building extant in 1993; abuts Terminal
- 3: Machine Shop on 1st floor of Food Warehouse; demolished for Terminal
- 4: Machine Shops rebuilt after 1906 incorporating brick walls of Gasworks. Christie Brothers' Machine Shop at corner of Howard extant 1993.
- 5: Machine Shop

Non-Ferrous Metals and
Hydrocarbons Industries
Shaded in Dark Gray:

- 6: Sander's Company
Copper & Brass Works

The fire resulted in a shift of land uses throughout Tar Flat, away from small foundries and machine shops, and towards warehouses and consumer goods industries. On Block C, this change was especially marked, with the Mission Street frontage of the Block remaining mostly vacant until large office and loft buildings were built, and with larger masonry structures along Fremont and Beale replacing the foundry and boiler-making complexes that had grown up over the years.

The large 100-vara lot at Fremont and Mission remained most mostly vacant as late as a decade after the fire, with only a small blacksmith shop on Mission and the Williams Co. machine shop on Fremont, both housed in temporary buildings. A large office building was later built on this lot in; it was severely damaged in the 1989 Loma Prieta earthquake, leaving a vacant lot in 1993. Next to it, the California Boiler Works rebuilt on its lot, constructing a large and very substantial reinforced concrete building that still survives, abutting the Transbay Terminal East Unit. Occupying the terminal site itself, several multi-story brick buildings housed consumer industries, such as a candy factory and a coffee and tea warehouse. To the south of the Transbay Terminal site, several industries rebuilt, including the Evans pump works at 183-187 Fremont, and the Christie Machine Works at 193 Fremont. Both of these firms remained in operation through the 1930s.

The major potential source of post-1906 hazardous materials contamination on the block is the Sander's Company Copper Works, which occupied a large lot at the corner of Beale and Howard streets, and which was housed in a light, corrugated-iron and wood frame building. The works remained in business through the 1920s.

After 1906, the Beale Street frontage of the block was rebuilt with substantial masonry warehouse buildings at 140-164 Fremont, demolished for construction of the Transbay Terminal approaches. These structures were mainly used for storage, but portions of them also housed a bolt and nut factory circa 1920, and an iron and steel company through the 1920s. Adjacent to these warehouses on the north, a machine shop was housed in a wood-floored, corrugated iron sided building constructed shortly after 1906; it remained until demolished for the terminal approaches.

Block D: Bounded by Mission & Howard, Fremont & First Streets

Summary

Occupied by the front plaza and central concourse of the Transbay Terminal, Block D was the first center of the iron founding industry in San Francisco in the early 1850s, and later became the site of non-ferrous metals industries through the 1920s. Plate 5 shows the First Street frontage of Block D in 1851, including two of the first iron foundries on the Pacific Coast. By the 1870s, land use on the portion of Block D north of Natoma Street included iron foundries and non-ferrous metal works, together with some wood-working establishments, such as the Mechanics Mill at the corner of Fremont and Mission. In 1872 this mill burned in a major conflagration that destroyed many adjacent properties. On the portion of the block between Natoma and Fremont streets, the San Francisco Gas Light Company constructed the first coal gassification plant west of Saint Louis in 1853. This plant continued to operate through at least 1891; in 1896 its buildings were acquired for a brass works and iron foundry, and its subsurface gas holder cisterns were filled in. There is no documentary evidence of subsequent impacts on these brick cisterns. Most of the substantial brick walls of the original 1853 structure survived the 1906 fire, and were used by post-fire buildings.

After the 1906 fire, metal works returned to the block, including a solder factory at the northwest corner of Natoma and First streets, which was one of only two lead works in San Francisco at the time. Some of these non-ferrous metal works continued in operation through the 1920s, including the solder factory. The area presently occupied by the entrance plaza of Transbay Terminal was the site of two large, multi-story post-1906 office buildings. By the time these buildings were demolished for the construction of the Transbay Terminal in 1936-1937, the entire Tar Flat industrial district was largely moribund due to changing technology and the effects of the Great Depression. Industrial operations on the former gas-works site gave way to non-hazardous uses by the 1930s.

Natural Site

The 1852/53 Coast Survey Map shows the original shoreline of Yerba Buena Cove curving across Block D from the alignment of Mission Street, midway between Fremont

and First streets, to the alignment of Fremont Street, midway between Mission and Howard. From there, the shore generally followed the line of Fremont Street south to Howard. Transbay Terminal construction photographs, showing the block cleared of structures and excavated, reveal differences in the appearance of the underlying soil that roughly correspond to the line of the original bay shore. The original shoreline on Block D was a sandy beach, backed by a sandy bluff near the line of First Street. The highest point on Block D was a sand-hill near the corner of First and Howard; partially cut away for the grading of First Street and bisected by the alignment of Howard Street, the remains of this hill were still listed as forty feet in elevation on the 1052/53 Coast Survey Map and may be seen on the cover plate, taken in the winter of 1851.

During the early 1850s, filling of Yerba Buena Cove took place mostly to provide improved wharfage and space for related warehouse facilities; filling was haphazard because of economic conditions, and largely bypassed the southern end of Yerba Buena Cove. Thus, the view of Block D on the cover plate shows the shallows of the bay and much of the sandy bluff behind as it was described in contemporary narratives, including those as early as 1849. Early Gold Rush filling operations initially bypassed Block D; the 1852/53 Coast Survey does not indicate any extension of the original shoreline, though extensive filling had already taken place to the north of Block D across Mission Street.

As in much of the Tar Flat district, the filling of Block D followed the establishment at city grade of adjoining streets. Fremont Street was filled and opened between Mission and Howard no later than 1857, and probably as early as 1854, when the gasworks opened. The 1857/58 Coast Survey Map indicates that the portion of Block D near Fremont and Mission streets, in roughly the eastern half of the Transbay Terminal entrance plaza, remained an unfilled pool or mudflat. Cut off from access to the bay, this pool was probably the repository of much of the refuse of nearby properties, such as the San Francisco Gas Works. The same map indicates that the northeastern portion of the central unit of the terminal building, sited over the original bay shore, rests on land filled after 1852. This filling was undoubtedly associated with the construction of the San Francisco Gas Light Company works on the section of the block south of Natoma Street in 1853, which required the levelling of the sandy bluff near First and Howard streets.

The completion of the filling of Block D may be dated to 1859-1860, with the construction of the large Mechanics Mill structure at the southwest corner of Mission and Howard streets on the site of the land-locked pool shown on the 1857/58 Coast

Survey. Any filling operations subsequent to 1860 would have been limited to bringing low lying lots up to city grade. Some of these low-lying lots may well have not been brought up to established street grades until the 1870s, especially on the sites of early foundries between First and Fremont streets, which were built near the level of the natural sandy beach.

Two Early Foundries

The natural beach of Yerba Buena Cove made Block D a natural site for early iron founding activities; the shore between Mission and Folsom streets was the only substantial portion of the original beach of Yerba Buena Cove not to be filled or covered over during the 1849-1852 period. The emergence of the iron founding industry during the Gold Rush was the immediate result of the several disastrous fires that consumed much the nascent city; the fifth such conflagration, on May 4-5, 1851, left behind an immense quantity of scrap iron that provided the highly profitable impetus to the few iron molders in San Francisco at the time. The Donahue brothers accumulated, in the course of a few months, the base of their substantial fortune from their foundry at the northwest corner of Mission and First; on Block D, two smaller foundries, the Pacific Iron Works and the Vulcan Foundry, had commenced operations at the same time.

Both foundries fronted on First Street near Howard, occupying lightly built frame structures constructed directly on the original beach of Yerba Buena Cove, and so some 8-10 feet below the established grade of First Street.

The cover plate shows the Pacific Iron Foundry in the left center, with the Vulcan Ironworks to the right, set back approximately forty feet from First Street near the corner of Natoma. Behind the rooftop sign of the Pacific Iron Foundry, a small, sidewheel steamboat floats near the intersection of Fremont and Mission. To the right rear of the same foundry, the framework of a pile driver shows where water lots are being demarcated along the alignment of Fremont Street, roughly midway between Mission and Howard. Beyond it, the open water of Block C extends as far as a line of pilings marking the route of Beale Street.

Plate 5, the third section of the seven-part 1851 panorama, looks down First Street from Howard towards Market, with Block D on the right. The front of the Pacific Iron Foundry, with its white sign facing First Street and iron castings stacked along the street, appears at the far right. The difference between the established grade of First

Street and the natural ground level can be clearly seen; the foundry floor of the Pacific Iron Works was set approximately eight feet below city grade, just above the high tide line. Several of the buildings on First Street on Block D to the north of the Pacific Iron Works are shown on Plate 5 with raised pile foundations, bringing their ground floor up to street level. Veteran foundryman Joseph Moore recalled the first years of the Vulcan Foundry for Hubert Howe Bancroft:

The Vulcan, when I first started [circa 1851], was on the beach, consequently very much below the grade of the city. They had very few tools, and those not very good. . . . In the course of a few years, Fremont Street got filled in, and First Street was nearly at the grade; the consequence was that during all their operations on the first site west of Fremont Street they had to work at a very great disadvantage, under the grade of the street some 8 feet, where the tide used to ebb and flow, and pumps had to be continually kept at work to keep the place free from water.

With all these difficulties, they had the reputation of turning out the more substantial and well planned work on the Coast, and had built up to '68 many of the largest sawmills and quartz mills, and even steamboat engines. . . .
[*Dictation of Joseph Moore MSS:NP*]

As the 1851 view shows, both the Vulcan Foundry and the Pacific Iron Works began as small operations, but unlike Peter Donahue's Union Ironworks on the northeast corner of Mission and First, the two foundries on Block D were only conspicuously successful during the late 1850s through the mid-1860s. A report to the 11th session of the State Legislature (circa 1860) mentions both the Vulcan Foundry and the Pacific Ironworks as two of the most important California industries; at the time, the Vulcan works had an annual business of \$500,000, and the Pacific Iron Works, though somewhat smaller in its volume of business, already had a core oven capable of melting 13,000 pounds of iron at a firing, and employed as many as 90 men (Muscatine 1975:190). Both foundries remained in operation on sites within the study area through the 1890s, but both had been surpassed by larger and more sophisticated Tar Flat foundries by the 1870s.

The Pacific Iron Works was founded in 1849 as a small operation, dependent entirely on scrap iron for its limited production. By 1860, its address was listed as the "Pacific Foundry" in the business directory at "First near Mission"; the listing reflects new management, and probably also a move from the original site near First and Natoma for a site closer to Mission Street. By the mid-1860s the foundry had acquired the street number of 127 First and extended its property through to Fremont Street, occupying two 50-vara lots. As late as the 1899 Sanborn Map, the foundry's buildings

on these lots remained standing, with the notation "old" appended to them; they were destroyed by the 1906 fire.

In relation to the Transbay Terminal Center Unit, the foundry site is identical with the streetcar ramp and main entrance of the terminal building. The foundry remained in business within the study area through the 1890s, under the proprietorship of Rankin, Brayton, and Company. Hittell describes the Pacific Foundry in 1864, during the Comstock boom, when the Tar Flat foundries were producing all they could of the every type of mining machinery to meet a great and urgent demand:

The Pacific Foundry is on First Street, between Mission and Natoma, and was established by Egery & Hinkley in 1849, and is the second oldest in the city. In 1853 it passed into the hands of Goddard & Company, under which name it is still conducted by the present proprietors--Ira P. Rankin, A. P. Brayton, Jr., and A. C. Austin.

The present buildings of this foundry cover two 50-vara lots, running through from First to Fremont Street. The building fronting First Street is of brick, 30 by 60 feet, and three stories in height. A portion of the building is occupied by the office and the remainder by the pattern and machine shops. A one-story brick building, about half the width of the front building, is carried back to Fremont Street, and is also in part occupied by the machine shop and the molding department. . . . The boiler department is a large wooden building fronting on Fremont Street, with the blacksmith department in another large building to the rear.

The Pacific Iron Works gives employment to from 150 to 175 hands, and its daily running expenses are about \$2000. The machinery is driven by an 80 horse power engine. The melting capacity of the largest cupola is 20 tons. There are two others of a combined capacity of 20 tons, making a total melting capacity of 40 tons per day. [Hittell *Our Industrial Resources*--No. 19 1864:NP]

Between the 1860s and the late 1880s, the volume of production carried out at the Pacific Iron Works grew somewhat, but the works lost ground to competing Tar Flat foundries, and in particular to the Risdon Ironworks, which was designed specifically to respond to the demand for specialized mining machinery that arose from the exploitation of the Comstock Lode during and after the Civil War. Although the Pacific Ironworks did manufacture mining equipment, it was not known for producing the very large and sophisticated equipment that advanced mining technology required by the 1870s. Instead, by the late 1880s, the general production of the works was typical of the mid-sized foundries of Tar Flat, supplying castings and machinery to smaller mining

operations, whose proprietors did not need, or could not afford, the latest patented technology:

The products of these works comprise every description of iron work, including mining and milling machinery, plants for gold and silver mines, water jackets, smelting furnaces for silver, lead, and copper ore, hoisting works, chloridizing furnaces

The works employ 250 men in different capacities, all of whom thoroughly understand the business. Special attention is given to the manufacture of mining machinery, engines, boilers, etc. The volume of business annually transacted amounts to \$400,000, and the average payroll is from 6 to 8 thousand per month. Operations are carried on all over this coast, Mexico, Central America, and South America. [Liggett 1889:71-72]

The operations of the other Gold Rush foundry on Block 4, the Vulcan Foundry, closely resembled those of the adjacent Pacific Ironworks. Joseph Moore, in charge of the foundry in the early 1860s, described the foundry's early operations in his manuscript recollection:

The Vulcan Ironworks were established in, I think, the year '51, on the corner of Natoma and Fremont streets, and was then immediately upon the shore. It was established by Gordon and Steen, neither of these men were practical mechanics. Gordon was a business man, and Steen had a slight knowledge of mechanics, not very much.

These men carried it on for some little while, and in the course of a couple of years I think they leased the works on an agreement to Paul Torquay, a Frenchman with a theoretical education in mechanics . . . ; Samuel Aitken, a very practical boiler-maker, Steiger, a very good foundry from Boston. . . These men continued for a little while, and were not very successful. Another arrangement was made The place was still, while doing a great deal of work, not very profitable. . . . [Moore MSS ND:NP]

The Vulcan Foundry continued in business on its original site, just north of Natoma Street on First, through the mid-1860s. In 1867 Joseph Moore decided to open his own foundry across Fremont Street from the Vulcan Foundry on Block C, but although a well-equipped foundry was built, Moore's partner suddenly died, and he soon sold his new foundry to the Vulcan Foundry, which had suffered a major fire shortly after Moore's new establishment was completed. Thus, most of the operations of the Vulcan Foundry were relocated to Block C, at 135-145 Fremont Street, where the foundry

remained in business through the early 1890s. Hittell described the Vulcan Foundry in the mid-1860s, before it moved to Block C:

Originally established on First Street, the progress of time and increasing patronage demanded more spacious workshops, storehouses, and yards. New buildings were erected, extending from Fremont to Beale streets. The premises now front 137 feet 6 inches on the former and have 275 feet in depth. The company own this property, as well as the lots extending to Mission street. Substantial brick and frame buildings are used for a machine shop, boiler shop, blacksmith shop, pattern, shop, and for casting and storage departments. The offices are on First Street [e.g., at 135-45 First, in a building shown as still standing on the 1887 Sanborn Map).

It is the intention of the Vulcan Co. to concentrate all their business on Fremont Street, and to dispose of their old premises for other purposes.

Connected with these works is a boiler shop, perhaps the finest in California, which is provided with the most approved tools. It was erected last fall. Its dimensions are 137 1/2 feet by 60 feet; and the height is 24 feet, between floor and beams. The shop has a small upright steam-engine, connected with a line shaft direct Eight boilers are now underway, one of which is intended for a river steamer [Hittell Scrapbooks vol. 1:9].

Although Hittell does not mention the fire that led to the foundry moving across Fremont Street, another entry in his scrapbooks, dating the late 1860s, describes the change:

These works are located at 137 and 139 First Street, and were established in 1851 by Gordon and Steen. In 1855 they were incorporated as a joint stock company and in 1857 became the property of the present owners, R. Ivers, C.R. Steiger, and S. Aitken. Only a part of this establishment is now in operation, consisting of the Company's new shops on the east side of Fremont Street, in which about 100 men are employed.

The old and larger shops on Natoma and Fremont Streets are being demolished, with a view to the erection in their stead of a block of brick buildings, the plans for which combine the latest improvements and conveniences in machine shops, and are designed for the manufacture of a larger class of machinery than has heretofore been built in this State. . . . [Hittell Scrapbooks vol. 1:31].

The new brick building which Hittell mentions was indeed built as he described, but was sold or leased to the Garratt Brass Foundry, and is pictured in Plate 7. In later years, Garratt claimed that he had built the structure himself.

Industrial Development, 1860-1906

Between Fremont and First, the Mission Street frontage of Block D received its first recorded industry in 1859/1860, when the Mechanic's Mill was constructed on the corner of Fremont and Mission. As late as the 1857 Coast Survey, the site of the Mechanics Mill was a pool or mudflat cut off from the bay by the filling of Fremont Street; the 100-vara lot was probably filled to allow for its construction. At first, the Mechanics Mill was a frame structure; this burned in a spectacular fire in 1872 that also consumed much of the Fremont Street frontage of the block. It was rebuilt as a three-story brick building of unusually solid construction, with floors formed by shallow cast iron arches filled with brick and concrete. It was a very expensive flooring method that had been developed in England several decades earlier, and one that was used where guarding against the risk of fire was especially important. In the case of the Mechanics Mill, the risk of fire had already been demonstrated; in the earlier frame structure, a destructive fire was virtually inevitable at some point because of the inflammable materials that were used and stored there.

The function of the Mechanics Mill was to provide work space with belt-driven power to various tenants engaged in woodworking. A stationary engine, located on the ground floor at the back of the building, approximately 135 feet south from Mission Street, provided a single source of power conveyed through ceiling-mounted leather belting to workrooms all three floors--freeing the individual woodworker tenants from the cost and inconvenience of having to maintain their own power sources.

Tenants of the Mechanics Mill through the four decades of its existence included the Miller & Hampton, wood turners; Davis & Daloon, wood turners; S. A. Metcalfe, wood planing; Parrish & Brothers, the only pail and tub manufacturers listed in the San Francisco business directory in 1859; J. A. Overand, who had an oakum works there from 1859 through the mid-1860s; Davis & Haller, manufacturers of "Columns of all kinds, Newell Posts, Ballusters, Billiard and Ten Pin Balls, and all kinds of Cabinet and Steamboat Turning done to order" (1859 directory:456); and Metcalf & Brokaw, makers of doors, sashes, shutters, and blinds. There were also many other, smaller woodworkers who rented space in the mill, but there is no record of non-woodworking operations being carried out there, except for the oakum mill noted above.

The Mechanics Mill was still in business at the time the 1899 business directory was being prepared, but by the time the 1899 Sanborn Map was surveyed, it had been demolished and a new, five-story brick building was being built on its site. The new

building provided expanded quarters for the Cook Belting Company, which manufactured the same type of industrial leather belting that had conveyed power throughout the Mechanics Mill.

Adjacent to the Mechanics Mill, a two-story structure at 413-415 Mission Street was occupied by a brass foundry and copper works from the early 1880s up through 1906. The Roylance Brass Foundry was established in 1879, and by the early 1880s shared the building with Hoffman Brothers, Metallurgists. Although the building occupied a site only 40 feet wide, the foundry was one of the larger brass foundries in San Francisco at the time:

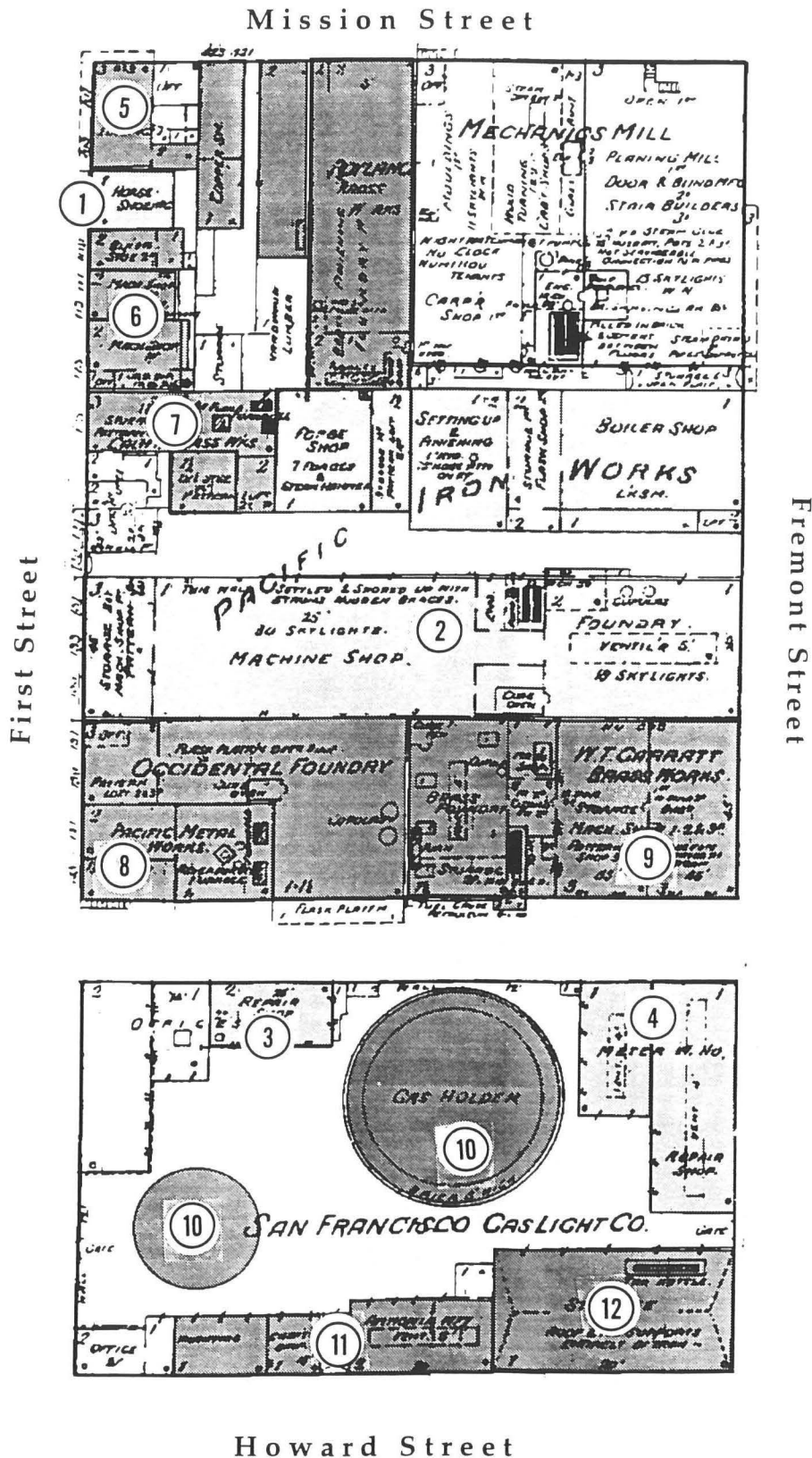
This concern engages in the manufacture of plumbing, steam, and water brass goods, and castings of every description, glove valves, angle, check, patent gate, safety, and gate valves; service, steam, and hose cocks, compression work, hose pipes, coupling, and x steam cocks. Fuller [hammered] work and plated goods are a specialty The trade is carried on all over the Pacific Coast and the volume is steadily increasing. . . . About 60 skilled men are regularly employed. [Liggett 1889:___]

In the basement of the building at 413-415 Mission, the Roylance Brass Foundry stored finished brass goods and raw materials; the front section of the ground floor contained offices and a display room, with the brass foundry occupying the rear two-thirds of the ground floor. At the very back of the building, 130 feet from Mission Street, and 95 to 145 feet from First Street, was a row of furnaces and a core oven. The second floor of the building was devoted to brass finishing work, including the plating work that was a specialty of the works.

In 1888 the Roylance foundry moved to a location two blocks away; the building was then used for several years to house part of the operations of Miller & Hampton, who made doors, sashes, blinds, and ornamental woodwork. Miller & Hampton continued to be listed as tenants of the adjacent Mechanics Mills; the former brass foundry served as an annex. By the mid-1890s, the Sanders Company copperworks had replaced Miller & Hampton on the site, engaging in a full range of coppersmith and metal plating work.

Sanders Company had begun operations prior to 1875 at 421 Mission Street, part of a complex of buildings grouped around a rear yard; access to the yard was achieved through a narrow private alley leading off of Mission Street, flanked by a pair of two-story buildings. An elevated belting system conveyed mechanical power to both structures. Although business directory research suggests that the compound had been

Map 5: 1887 Sanborn Map of Block D:
Bounded by Mission & Howard, First & Fremont Streets



Key to Historic Potential
Hazardous Materials Sites

Ferrous Metals Industries
Shaded in Light Gray:

- 1: Blacksmith
- 2: Pacific Ironworks;
Machine Shops
- 3: Gasworks Repair Shop
- 4: Gasworks Meter Shop

Nonferrous Metals and
Hydrocarbon Industries
Shaded in Dark Gray:

- 5: Pacific Tool Works;
Boiler Compounds,
Metal Plating
- 6: Brass Foundry;
Sheet Metal Works;
Pacific Metal Works,
Solder Making
- 7: California Brass Foundry,
1860s-1900s
- 8: Pacific Metal Works,
Solder Manufacturers;
Vulcan Foundry in 1850s
- 9: Garratt Brass Works;
Vulcan Foundry in 1850s
- 10: Gas Holder Cisterns
- 11: Gas Purifying Houses
- 12: Gasworks Retort House;
Tar Kettles, 1854-1891;
Iron & Brass Foundry,
1896-1906

built in the early 1870s. Sanders tenanted one of the two structures fronting on Mission Street for two decades until moving to 413-415 Mission around 1895. Advertising himself as a coppersmith, Sanders' operations included a large forge located in an open-sided shed constructed in the rear yard. An idea of the range of products produced by Sanders can be obtained from an examination of Plate 8, showing some of the goods produced by the Wagner & Todt Copper Works on Block E. After Sanders moved to 413-415 Mission, the forge was removed and the building at 421 Mission converted into a factory producing electric lights.

Across the alley from 421 Mission, Morris Dobrensky operated a brass foundry at 417 Mission from at least 1875 through the early 1880s. Dobrensky had established his business manufacturing gas meters for the nearby San Francisco Gas Light Company in 1856/1857, but the site of this operation was not recorded, though it may well have been the property he later occupied. By 1887, the building at 417 Mission housed a wood-turning shop which remained there through 1906.

The lot at the corner of Mission and First streets, with street addresses of 423 Mission and 101-103 First, was used through the turn of the century for a corner saloon and boarding house that probably dated back to the 1850s. Shortly before the 1906 fire, the site of the boarding house was occupied by the Pacific Tool Works, a wholesale tool dealer that also made boiler compounds and engaged in metal plating operations. On First Street, adjacent to the corner building, a blacksmith shop dated back to at least 1875, when it was under the proprietorship of Thomas Ford, who had begun his career in Tar Flat as a laborer at the Vulcan Foundry two decades earlier. As late as 1900, the blacksmith shop was still in operation.

At 109-113 First, a two-story building was occupied by a number of metal working operations throughout the 1880s and 1890s, including the Olson & Nevers Brass Foundry in the early 1880s; a machine shop in the mid-1880s; I. J. C. Truman, blacksmith, in the early 1890s; and a sheet metal works in the late 1890s.

From 1878 until 1886, the property at 115-117 First Street was the site of the Morrow & Strong Lead Works, engaged in producing lead solder, piping and sheeting, and babbitt metal. The business also operated as the Pacific Metal Works at the same address; the business directories of the 1880s listed the Pacific Metal Works as an iron foundry, but in later years it became exclusively a lead works specializing in lead solder production. Isaac Burton, a machinist engaged in nut making and elevator building, was also a tenant in the building throughout the 1890s. After the Pacific Metal Works moved to a site at the corner of First and Natoma, the Burton's machine shop remained.

One of the most enduring metal working industries of Block D was the California Brass Foundry, in operation at 125 First Street from the early 1860s through the early 1900s. In business directories over a forty-year period, the California Brass Foundry is listed not only under brass founders, but also under babbitt metal manufacturers and bell founders. The internal arrangement of the California Brass Foundry was similar to other brass foundries within the study area: fronting on First Street, both the first and second floors were machine shops; to the rear was the foundry area, with three furnaces; a loft was used for pattern storage. Since the California Brass Foundry occupied a corner of what would otherwise be a standard 100-vara lot, the remainder of which was owned by the Pacific Iron Works, it is possible that the brass foundry worked in partnership with the ironworks, which is not shown on the 1887 Sanborn Map as having its own separate brass founding area. The California Brass Works remained in operation after the Pacific Iron Works had closed; from 1876 to 1878 the brass works shared its quarters at 125 First with the Pacific Metal Works, engaged in lead working.

The Pacific Iron Works, occupying much of the present site of the Transbay Terminal Center Unit, and filling two 100-vara lots extending through to First Street, was discussed above as one of the first two foundries in the study area. The foundry ceased operations in the study area circa 1895, but its facilities remained intact through 1906, portions of which dated back to the 1850s. The section of the ironworks fronting on First Street, which had housed machine shops, continued in operation as the California Machine Works, with a street address of 129-135 First. The machine works was a larger operation than the typical machine shop of the 1890s, engaging in engine building and elevator building as well as general machinist work; elevator building gradually became the specialty of the firm. The machine works shared the building with Edward Read, an oil dealer; whether Read stored oil on the site or merely had offices in the front of the building is unclear.

Occupying an L-shaped lot fronting on both First and Natoma streets, with a street address of 137-139 First, the Occidental Foundry occupied what had been the site of the Vulcan Ironworks before it moved to Block C in 1868; business directories list the Occidental at this site from the early 1870s through the mid-1890s. Except for a three-story structure fronting on First Street, housing offices and pattern storage, the Occidental Foundry's facilities were contained within a one-and-a-half-story shed structure, which was almost certainly earth floored. Inside were two cupola ovens and one core oven, with the rest of the floor space used for casting. The Occidental Foundry was, by the 1880s, a somewhat out-of-date iron works, since it only engaged in

founding, instead of combining founding with machine shop work. By 1896 it had closed and its facilities were demolished to accommodate the prosperously expanding Pacific Metal Works, whose solder factory had previously been confined to a small structure bounded by the Occidental's L-shaped lot.

The Pacific Metal Works site may have significant potential for historic hazardous materials contamination. The works primarily made lead solder, and was for many years a principal supplier of solder to northern California, and a major supplier throughout the Pacific Coast region. The solder factory was established in 1876 by F. B. Morrow and N. R. Strong at 125 First Street, sharing space with Weed & Kingwell's California Brass Foundry. In 1878 the Pacific Metal Works moved to its own quarters immediately adjacent to 125 First at 115-117 First Street, occupying a two-story masonry structure. The works moved again in 1886 to a third site at 141-143 First Street, at the northeast corner of First and Natoma. By the late 1890s this corner structure was used for a machine shop, while the Pacific Metal Works occupied the L-shaped site just behind it, which had been the site of the Occidental Foundry for the preceding two decades; this same site had been occupied by the Vulcan Ironworks as far back as 1850.

Both the corner structure and the L-shaped rear structure were four-story masonry buildings with full basements. By the time the 1899 Sanborn Map was surveyed, part of the basement area was used for metal working--a tin-working shop, for example, was housed in a section of the basement along Natoma Street--while another part of the basement was leased out for use as a wine cellar. The upper floors of the building housed, at different times, a paper box factory, several machine shops, and ancillary metal works specializing in solder-intensive work, such as a metal cornice shop.

The Pacific Metal Works was an unusually successful and enduring firm that came to dominate the local solder market. Its success was largely due to the advanced machinery that the manager of the works designed to mechanize and rationalize the solder-making process:

For several years a specialty has been made of solder for fruit canneries, and within the past year [1888/89] the firm has put in an entirely new plant with machinery, perfected and patented by Mr. Reese, the superintendent, for running, reeling, and cutting canners' solder.

The solder as generally made is run in bars about 16 inches long in a closed mould, which requires the service of several men; by this new process it is run upon a reel, from which it passes through rolls which feed it to the cutter, the drops being made longer or shorter by simply changing the gear.

One man can attend to the making, reeling, and cutting of the solder, which by the old process required several--not only this, but the output is greatly increased. The firm is favorably known over the entire Pacific Coast for fair business dealing and the high quality of the metals. Through push, energy, and honest dealing, it has secured a large share of the white metal trade. [Liggett 1889:72]

The solder machinery is noted on the 1899 Sanborn Map; mostly, it was located on the ground floor of the building, with the lead-melting furnace in the rear corner of the structure, in almost the exact center of the site of the Transbay Terminal Center Unit.

Manufacturing solder was not the only business of the Pacific Metal Works. *The Industries of San Francisco* provides a partial listing of the scope of the works' activities: "Its proprietors import pig lead, pig tin, ingot, sheet and bar copper, antimony, zinc, bismuth, nickel, etc., and manufacture tinnern's and plumbers' solder, Babbitt metal of all grades, bar and strip lead, type metals, etc." (Liggett 1889:71). Because of the heavy weight of these metals, materials were stored in the basement and brought up to the working area on a ramp.

The Pacific Metal Works extended half of the length of Natoma Street, to a point midway between First and Fremont. The other half of the north side of Natoma was occupied by the W. T. Garratt Brass Works, whose facilities covered a 50-vara lot with a street address of 138-142 Fremont. Garratt moved his works to this site in 1872; he remained there until 1906.

William T. Garratt had been one of the pioneer brass founders of San Francisco; by the 1870s he was one of the most important industrialists in the city, and an especially important figure in Tar Flat; he had served in the State Senate from 1870 to 1874--"to please my friends," as he disarmingly explained to Hubert Howe Bancroft. Liggett described the history and operations of the of the Garratt works in 1889:

The brass and bell foundry and machine and hydraulic works of W. T. Garratt and Co. had their beginning in San Francisco in 1850. For years this was the only house where brass founding was done with similar mechanical labor on this coast. The business was small at the beginning but in 1853 took a definite shape and has continued to increase until now.

The works are among the most important of the kind in the United States for the variety of their products. The articles made include bells, hydrants, valves, faucets and miscellaneous casting, from the smallest to largest size, in brass, Babbitt metal, and other alloys. In iron and general machine business, Messrs. W.T. Garratt and Co. make globe valves, safety valves, fire hydrants, water and gas gates, and cast iron fittings for large pipes.



Plate 7: Located on the Site of the Transbay Terminal Central Unit, the W. T. Garratt Brass Works was the largest brass foundry in the San Francisco in the last quarter of the 19th century. In the view above, Natoma Street is at the left extending north towards First Street, while the Fremont Street sidewalk displays some of the specialized products of the works. Mr. Garratt himself in his gray top hat stands behind several of the bells that were his greatest pride. An expert in the science of campanology, Garratt's greatest ambition was to refound the world's largest bell in Moscow, which had been broken for centuries. More mundanely, the Garratt works produced vast quantities of the brass castings used in ships, buildings, railway equipment, and specialized mining machinery. The foundry proper was located just to the rear of the brick building shown, which housed machine shops on all three floors, with the basement used for storage. The piles of materials that almost fill Natoma Street reflect the day-to-day operations of the foundry.

(Courtesy of the Bancroft Library)

Among the specialties of the firm may be named Hooker's direct action steam pump, Richard's centrifugal pumps, Hall's Patent Duplex Steam Pumps, pumps for wineries, electric pumps, hand pumps, air compressors, and mining pumps.

The brass foundry and office are located on the corner of Fremont and Natoma Streets while the Pump and General Machinery Works are at the corner of Fifth and Brannan Streets. Both establishments are fitted with the most improved machinery, which is operated by a Corliss engine of immense power. The largest and best bells on this coast were cast in this foundry and it is said that a greater variety is done here than in any other [such] establishment in the United States. . . .

The firm enjoys a large trade which extends to all parts of America west of the Rockies, into Mexico, South and Central America, Australia, China, Japan, and the island of the Pacific and is in all particulars one of the most important pillars in San Francisco's temple of manufacture. (Liggett 1889:64)

If anyone exemplified the proudly inventive spirit of Tar Flat, it was William Garratt. He played a significant role in establishing the metals industries in Gold Rush San Francisco; he survived and prospered for so long that he became known as a venerable font of wisdom. In his later years, his judgments were eagerly sought and highly regarded on such important and esoteric subjects as Darwinism and the influence of heredity upon character; phrenology and the relation between physiogamy and worldly success; and the practical standards to be used in assessing the relations between labor and capital.

Garratt had come to California from Cincinnati in 1850 at the age of 20, having learned the brass founding art from his father beginning at the age of 11. In the San Francisco of the early 1850s, Garratt quickly became widely known as the quickest and most resourceful brass worker in the new metropolis, making vitally needed and otherwise unobtainable replacement parts for ships and machinery with gratifying speed, while using only the primitive and makeshift tools that he could obtain or devise.

Much of Garratt's early work involved making parts for damaged steamships; for decades he was a director of the Pacific Mail Steamship Company, ensuring a steady supply of highly profitable maritime-related work for his brass foundry. His foundry's first location was north of Market Street; later he moved to the corner of Market and First, and was burned out there in 1863; he then moved again to Fremont and Mission and bought out the business of Edward T. Steen (listed in the 1859 business directory as a mechanical engineer at the Vulcan Foundry). Garratt recalled to Bancroft:

I bought his whole rig and went right into it. It was too valuable a piece of property for a business of that kind. I stayed there until 1872 and then the Mechanics Mill took fire and the flames crossed over and burned me out again. That was the third time. I think I must have lost \$130,000. . . Before the insurance paid up, the Chicago Fire happened, and the insurers went bust; maybe I got \$10,000 out of them. Then, after that, I purchased my present site, corner of Natoma and Fremont, and put up that brick building. That, I don't think, could be shaken down by an earthquake or burnt down by a fire, unless it took fire within itself. I have a large works on the corner of 5th and Brannan where I do all the iron work and such as that. There has always been more or less iron work done right in with the brass work [Garratt MSS:NP].

Garratt believed that he was a master of the "science of campanology," which he considered to be the most important test of skill in the brass-founder's art. He discovered new methods of fixing cracked bells so that the repaired bells sounded as good as ever. His life's ambition was to mend the largest broken bell in the world, in the Moscow Kremlin---"it will pay immensely to mend that crack"--and had he done so, Garratt would likely have obtained a place in the encyclopedias that were his favorite reading. As well as brass work, Garratt also made many castings in gun metal, some were very large, weighing six tons or more, and took as long as 70 days to make: for example, a "digester" for the new San Francisco Candle Works was 21 feet long and 44 inches outside diameter.

Some idea of the Garratt works can be gained from Plate 7, the only known photograph of the works. The solid, three-story brick building, which Garratt believed was earthquake-proof, contained machine shops of all three floors, and a full basement used for storage. Behind this building, along Natoma Street, was the brass foundry proper, with a core oven, a cupola oven, a melting furnace, and a large steam engine that powered the machine shops. By the late 1880s, oil was used as the principal fuel--yet another innovation in which Garratt was ahead of his times.

The Garratt Brass Works remained in operation on this site until the 1906 fire. Following the fire, the works relocated to a new building on Block 3 near the corner of Fremont and Folsom, which remained standing until demolished for the construction of SF-480 in the 1950s.

San Francisco Gas Light Company works Site, 1896-1906

The entire southern third of Block D, divided by the remainder of the block by Natoma Street, was the site of the original plant of the San Francisco Gas Light Company works

from 1852 through the mid-1890s. The site was sold at auction on May 19, 1896, with the entire property sold to George Dow, proprietor of the Dow Steam Pump Works on Block C. Dow did not move his pump works to this much larger site; rather, he established a separate iron and brass foundry in the former gasworks facilities.

A comparison of the 1887 and 1899 Sanborn Maps shows that Dow did not make major physical alterations to the gasworks buildings. The large, iron gas holder (dating back to the first operation of the plant in 1854), was dismantled; the 20-foot-deep brick-lined circular pit in which it rested on a pool of water (which had provided an air-tight seal while maintaining stable gas pressure) was filled in to create a level, central yard. None of the brick buildings that surrounded this yard were demolished. Since the construction of a newer and larger retort house on Block C in the late 1850s or early 1860s, the original gasworks buildings had been increasingly used for offices or storage.

At the corner of Fremont and Natoma, a one-story brick building that had been used as a gas-meter storage warehouse and repair shop, continued in a similar function as an iron storage area. Separate from this building by a gated alley, the original retort house, previously used for storage and for housing a large tar kettle, became the main iron foundry. A core oven was constructed, using the old brick smokestack of the retort house; it was located 90 feet west from the corner of Howard and Fremont, placed against the Howard Street wall of the structure. Opposite this, on the other side of the building, a cupola furnace was installed in an open-sided shed that was built as an addition to the existing building. Adjacent to the old retort house along Howard Street, a smaller brick building had housed the ammonia manufacturing plant of the gasworks through the late 1880s. Dow converted this structure into his brass foundry, adding six melting furnaces inside the existing walls of the building, and building an open-sided shed on its north side, facing the central yard, which housed a new core oven.

The remainder of the gasworks buildings, extending along Howard Street to the corner of First, had contained a carpentry shop, a gas purifying house, and an office building. Dow used space in these buildings for storage, but the 1899 Sanborn Map notes that they were mostly vacant. Former offices and repair shops at the corner of First and Natoma were likewise left vacant by Dow. The only entirely new building that Dow erected on the site was a one-story structure used as a pipe shop; this building was located along Natoma Street, and extended out over the former site of the giant gas holder. The construction of this new building suggests that the gas-holder pit had been solidly filled in, and not merely partially filled or decked over.

Block D After 1906

All but one of the structures on Block D were destroyed in the 1906 fire, but many of the larger industries on the block rebuilt on their old sites. The change was greatest along Mission Street, on the site of the Transbay Terminal front plaza, where two large office buildings replaced smaller industrial structures; both remained standing until demolished for the construction of the terminal.

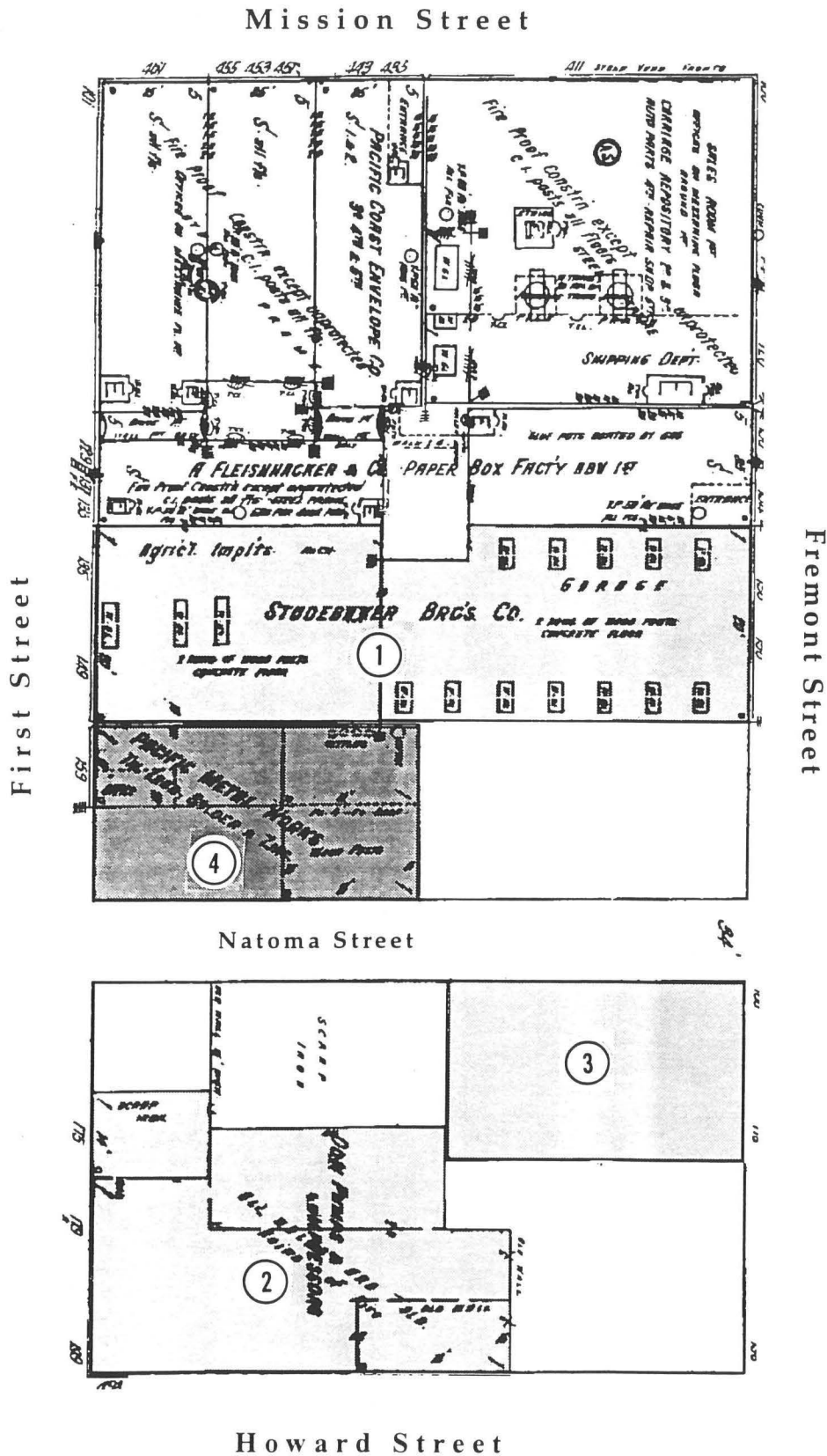
Along First Street, the Pacific Metal Works rebuilt its solder factory at the corner of Natoma; the new building, however, was only one-story high, instead of the four floors of the pre-fire structure. Since no basement is indicated for the new structure, it is likely that rubble from the pre-fire building had filled the existing basement, and was merely covered over in the course of reconstruction. The Pacific Metal Works continued in the solder-making and non-ferrous metals business through the 1920s.

Filling most of the pre-fire site of the Pacific Iron works, Studebaker Motors dealt in automobiles and farm machinery. The new structure was a one-story brick garage with a concrete floor; it filled its entire lot, with entrances on both Fremont and First streets. The remainder of the site of the Pacific Iron Works became the site of the Fleishhacker Paper Box Factory following the 1906 fire; the box factory remained until the building was demolished.

On the southern third of the block, George Dow's iron and brass foundry was rebuilt after 1906 within the surviving brick walls of the 1853 gasworks building. The new facilities housed the steam pump works that had previously been located on the corner of Mission and Beale on Block C. The pump works included large portions of the original gasworks walls, including the old ammonia plant and a large section of the original retort house. The Dow Steam Pump works only occupied the western portion of the gasworks site; at the corner of Fremont and Natoma streets, the Eureka Boiler Works constructed a very substantial, reinforced concrete structure, which was doubtless intended to be fireproof. The boiler works remained in operation there through the late 1930s.

In summary, apart from the probability of hydrocarbon residues on the gasworks site, including possibly extant subsurface features, such as the gas holder cisterns and buried piping, the location with perhaps the greatest potential for both pre- and post-1906 hazardous materials contamination on Block D would appear to be the Pacific Metal Works at the northeast corner of First and Natoma.

Map 6: 1913 Sanborn Map of Block D:
Bounded by Mission & Howard, First & Fremont Streets



Key to Historic Potential
Hazardous Materials Sites

Ferrous Metals Industries
Shaded in Light Gray:

- 1: Studebaker Autos
- 2: Dow Steam Pump Works,
built within surviving
walls of Gasworks
- 3: Eureka Iron Foundry,
concrete building

Non-Ferrous Metals and
Hydrocarbons Industries
Shaded in Dark Gray:

- 4: Pacific Metal Works;
rebuilt on pre-1906 site

Block E: Bounded by First & Second, Mission & Howard Streets

Summary

The Transbay Terminal West Unit is built on much of the central portion of this block, which is divided into three sections by Minna and Natoma streets; the approach viaduct to the terminal cuts across the center of the southern section of the block. Block E was developed as a residential district in 1849-1850, and remained almost entirely residential until the 1890s. The 1906 fire swept away the crowded tenements that lined Minna and Natoma streets, and these densely populated houses were not rebuilt. Instead, light industries moved into the portions of the block that later became the site of the Transbay Terminal, while larger loft buildings were constructed along Mission and Second streets. The potential for significant historic hazardous materials contamination is limited to small, non-ferrous metals industries, such as copper, brass, plumbing supply, and sheet metal works. These industries were in operation during the 1900-1930 time period.

Natural Site

The natural condition of Block E can be best understood through the 1852/53 Coast Survey and daguerreotype views dating as far back as 1851. Beginning near the present intersection of First and Howard streets, a 50- to 60-foot-high ridge of sand extended southwest along the alignment of Howard Streets past Second Street. By 1852 First Street had been cut through this ridge, but much of the sand hill remained little altered from its natural condition. To the south, and especially to the north of the alignment of Howard Street, the ridge fell steeply away, dropping 30-40 feet before levelling out in the vicinity of Natoma Street.

Although the two-thirds of Block E that lay north of Natoma Street appear, on the 1852/53 Coast Survey, to have had an irregular terrain of smaller ridges and valleys, the contour lines on the map are misleading in this case. Two sections of an 1851 daguerreotype panorama, taken from the top of the sand ridge just to the west of First and Howard, show the entirety of the block north of Natoma, together with much of the north slope of the ridge. This daguerreotype view shows the two-thirds of the block north of Natoma Street as essentially level, though sloping slightly down towards

Mission Street. Beginning on the north side of Natoma Street, much of the block is filled with orderly rows of identical houses in the view. Archival sources identify many of these houses as prefabricated dwellings that were brought to San Francisco by ship in 1849-1850; these were some of the first conventional cottages to have been built in the Gold Rush city.

It would have made no practical or economic sense to engage in earth-moving operations to accommodate such dwellings in 1849-1850; there is no record of such grading taking place, beyond the establishment of First Street as a thoroughfare. The apparent elevations seen on the daguerreotype views cannot, of course, be related to modern grades with any degree of exactitude. Nevertheless, there is no reason to believe that the natural gradient of the two-thirds of Block E lying north of Natoma Street has been changed in any substantial degree from its natural state.

The section of the block lying between Natoma and Howard streets has been cut down substantially. Lithographic views drawn in the mid-1850s show the Howard Street sand ridge as an imposing obstacle; the 1857/59 Coast Survey makes it clear that only a short section of Howard Street west of First had been graded. It took until circa 1860 for Howard Street to be opened through to Second, and the approximate present grade of the southern third of Block E reached.

Block E Industries, 1857-1906

The earliest known industry on Block E was the A. C. Dietz Oil Works, located on the south side of Natoma Street, roughly midway between First and Second. In 1859, this was the largest oil refinery in the city, as the business directory of that year explains:

There are seven establishments engaged in the manufacture of camphene and the refining of oil, the aggregate capacity of which is estimated at over 50,000 gallon per month. The works of A. C. Dietz & Co., located on Natoma Street, is one of the largest and most complete; its capacity is 800 gallons per day. Over 75,000 gallons of camphene were manufactured at this establishment during 1858 [1859 directory:40].

The oil works refined whale oil, not petroleum, into lamp oil and other products for local consumption. By the 1860s, the whale oil refining business was a major industry, and plants were built along the southern waterfront and in the East Bay; the Natoma Street factory was probably closed or relocated to a waterfront location at that time.



Plate 8: Mission Street West of First, was the site of several ornamental metalworks companies from the 1870s through 1906, as well as the more utilitarian Wagner coppersmith shop. From the late 1870s through 1906, Wagner and his sons were located here; after the 1906 fire, they relocated to Minna Street on the same block, remaining in business through the 1920s. (*California Historical Society*)

The exact location of the Dietz oil works cannot be determined through directory information, but it is possible to adduce its probable site through visual sources. An advertisement for the Dietz works in the 1859 directory includes a detailed drawing, showing the refinery chimney belching smoke on one side of a two-story building, while a tall windmill appears to the rear of the structure. The very carefully drawn 1854 Otis view, rendered from the porch of William Babcock's house on Essex Street, just above Folsom between First and Second, shows a similar windmill structure rising above the Howard Street sand ridge from the north side of Natoma Street on Block E. Comparing the apparent site of this windmill with the 1857/59 Coast Survey shows a substantial building, too large to be a house, in the same position. Its site would appear to be just west of the Transbay Terminal viaduct structure as it crosses Natoma Street.

With the exception of this early oil refinery, the portions of Block E traversed by the Transbay Terminal approaches remained a residential neighborhood through the 1890s. The early prefabricated Gold Rush houses, inhabited by some of the most prominent families in the city in 1849-51, gave way to crowded tenement row houses that were the dwellings of many of the foundry and machine shop workers of Tar Flat and their families. Daguerreotype views from the 1870s and 1880s, taken from the top of the Selby Shot Tower at the corner of First and Howard streets, give an unusually detailed picture of land use on the block, confirming the absence of industries from all of that portion of the block which would become the site of the Transbay Terminal West Unit and its approaches. .

The First Street frontage of Block E was lined with shops, often with rooms to rent above. Until the 1890s, the only potentially hazardous industries along First Street were located between Mission and Minna streets. At the corner of Mission and First streets, the Babcock & Wilson Boiler Works was located in a wood-frame structure from the early 1870s through the late 1880s; in the 1890s this building became the final home of the venerable Vulcan Ironworks, by then reduced to a small machine shop specializing in engine building and repair. Other industries on this section of Block E included a metal plating works in operation during the 1880s at 108 First, midway between Mission and Minna; a brass foundry adjacent to it at 106 First, in operation from the early 1890s through 1906; and an asbestos fireproofing supply and paint company at 112 First, in operation from the mid-1890s through 1906. The asbestos company was not a large business; it occupied part of a small, two-story frame building.

Second Street was part of one of San Francisco's most fashionable shopping streets from the 1860s through the 1890s; no industries were located there prior to 1906.

Map 7: 1913 Sanborn Map of Block E: Bounded by Howard & Mission, First & Second Streets (Eastern Half)

Howard Street

Key to Potential Historic
Hazardous Materials Sites

Ferrous Metals Industries
Shaded in Light Gray

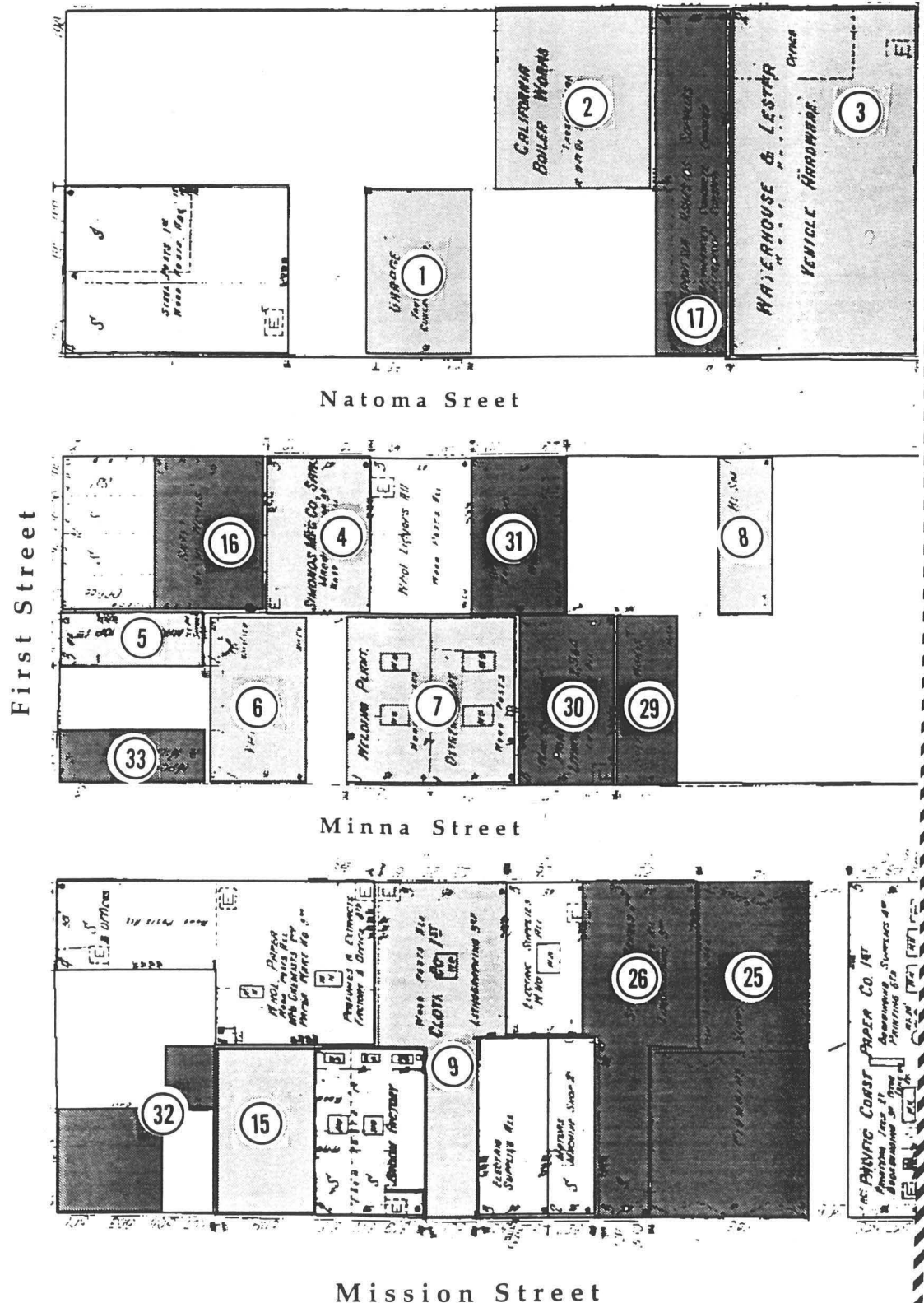
Post-1906 Industries:

- 1: Machine Shop, Garage
- 2: California Boiler Works
- 3: Vehicle Hardware
- 4: Saw-Making Works

- 5: Machine Shop
- 6: Machine Shop
- 7: Welding Plant
- 8: Blacksmith
- 9: Wire Works
- 10: Machine Shop
- 11: Electrical Parts Plant
- 12: Blacksmith
- 13: Blacksmith
- 14: Machinists

Pre-1906 Industries:

- 15: Blacksmith; Machinist



Map 7, Block E (Western Half)

Key to Historic Potential
Hazardous Materials Sites

Non-Ferrous Metals and
Hydrocarbons Industries
Shaded in Dark Gray

Post-1906 Industries:

16: Sheet Metal Works

17: Asbestos Supplies

18: Goodyear Tire
Rubber Factory

19: Paint Shop

20: Plumbing Shop

21: Dyes & Chemicals

22: Wholesale Plumbers

23: Copper Works

24: Printing Works

25: Plumbers' Supplies

26: Commercial Printing

27: Tin Can Factory

28: Sign Painting

29: Sheet Metal Works

30: Printing Plant

31: Aniline Colors

Pre-1906 Industries:

32: Brass Works

33: Brass Foundry

33: Wagner & Todt
Coppersmiths

34: Plumbers' Supplies

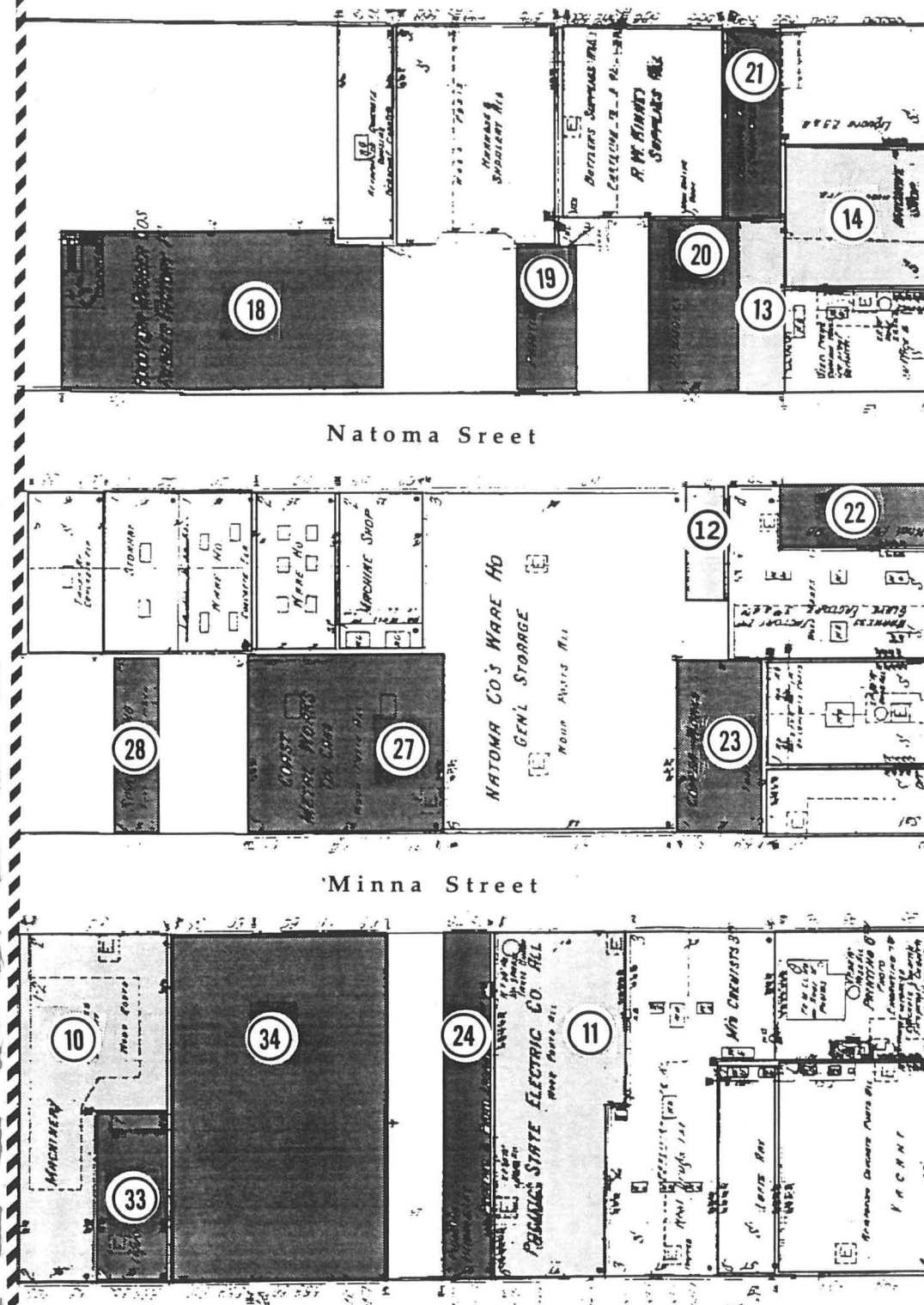
Howard Street

Natoma Street

Minna Street

Mission Street

Second Street



The section of Block E situated between Mission and Minna streets, initially built up with houses during the 1850s-1860s, remained almost entirely residential through the 1880s. Among the few exceptions were a blacksmith and wagon repair shop 321 First, a saw making shop at 511 Mission, and the Wagner & Todt coppersmith shop at 565 Mission, in operation from the 1870s through 1906, and shown in Plate 9.

During the 1890s, many of the houses along the Mission Street frontage of the block were demolished and replaced with two- to four-story loft buildings and small factories, while some existing structures were converted to industrial or semi-industrial uses. At the corner of Mission and First, an existing three-story building was adapted to house the Pacific Tool and Supply Company, a major wholesale hardware store that also dealt in some chemicals used by the metal-working industries of Tar Flat, such as solvents and lubricating oils. Adjacent to it, at 509-511 Mission, a former boarding house was converted to space that housed a machine shop and a woodworking shop. New loft buildings were erected at 523-525, 531-539, 549-555, and 573-577 Mission Street; in 1899 these structures housed a machine shop, garment factory, plumbing supply company, and hydraulic equipment factory, respectively.

Of these sites, the Daziel & Moller Plumbing Supply Company at 549-557 Mission may present a significant potential for hazardous materials contamination. Since the company was a wholesale business that supplied a complete range of plumbers' supplies, with stock that all filled four floors of a large building, the full range of hazardous materials associated with late 19th-century plumbing technology was probably present on the site in significant quantities. A rear yard behind the loft building, extending back to Minna Street and measuring 75 feet square, was used for storage of plumbing supplies and pipe-cutting. The site of this yard is approximately 60 feet away from a portion of the Transbay Terminal viaduct.

Directly on the site of the Transbay Terminal West Unit and its approaches, the only significant pre-1906 potential source of hazardous materials contamination was the Magnolia Metal Works, also known as the Western Brass Works, which was located at 40 Natoma Street from 1900 until 1906.

Block E After 1906

Although most of the block was still in residential use 1906 fire, no housing was rebuilt on the block in subsequent years. Along Mission Street, the pre-fire trend towards commercial loft buildings continued; as early as 1913, almost all of the area between



Plates 9 & 10: The West Unit of the Transbay Terminal and its approaches were constructed on piles resting on concrete footings, as shown in the photograph above, taken on October 29th, 1937. By January 21st, 1938, as shown below, the footings were completed together with their connecting concrete framework. The excavation here just reached the level of ground water; the soil was sand from the original dunes west of First Street. Unlike the filled land farther east, the section of this block shown in both views was not the site of significant industries with a potential for hazardous materials contamination; in the 19th century up through 1906, the interior of the block was residential, and the post-1906 industries were mostly non-hazardous and housed in brick and concrete-floor structures. *(both views, CALTRANS Bay Bridge Archive)*



Mission and Minna streets was filled with two- to five-story masonry or reinforced concrete structures housing a wide variety of light industries; a similar pattern of development took place along Folsom Street, though more slowly. In the central section of the block, between Minna and Natoma streets, rebuilding was slow, and a number of sheet-metal clad structures, erected for to house industries immediately following the 1906 fire, remained standing until most of the central section of the block was cleared for the construction of the Transbay Terminal West Unit and its approaches.

On the Transbay Terminal site, several such temporary, post-fire buildings housed potentially hazardous industries in the period through the 1920s. At the northwest corner of Natoma and First, a sheet metal works had quarters behind a row of shops opening onto First Street; the building was a frame structure covered in tin. Adjacent to it, the Simmonds Manufacturing Company had a saw-making factory that was housed in a three-story brick building. At 16 Natoma Street, the Asbestos Company of California provided boiler lagging, pipe insulation, fire-proofing asbestos products for structural uses, and asbestos paint. It shared quarters in a three-story brick building with a liquor warehouse. An identical structure at 18 Natoma served as a warehouse for aniline dyes. A blacksmith shop, a row of warehouse buildings, and a machine shop filled the remainder of the frontage of Natoma Street that was cleared to make way for the Transbay Terminal.

On Minna Street, a welding and oxygen producing plant occupied a pair of single-story brick buildings at 15-17 Minna; adjacent to the west was as four-story brick building that housed a commercial printing and lithography shop, with a sheet-metal works beyond it at 23 Minna. At 57 Minna, a sign-painting shop was housed in a one-story, metal-clad building constructed immediately after the 1906 fire. At the western end of the Transbay Terminal approach right-of-way between Minna and Natoma streets, the Coast Metal Works produced tin cans in a three-story masonry structure.

III: The Transbay Terminal Approach Viaduct Site

Block 2: Bounded by Beale and Fremont, Folsom and Howard Streets

This block was the last to be filled in the area traversed by the Transbay Terminal Viaduct. From 1854 until the mid-1860s, the still submerged viaduct right-of-way was used for disposal of waste tar from the nearby San Francisco Gas Light Company works. In the late 1860s, the viaduct right-of-way was filled to near its current elevation at city grade. The filling was done to create the site of the Risdon Ironworks. The ironworks was one of the largest and most important on the Pacific Coast from the 1870s through the 1900s, specializing in hydraulic equipment, boilers, sheet metal pipe, and mining machinery.

The viaduct right-of-way encompasses the northwest quadrant of the block, which was the site of the foundry, forge shop, and the original machine shop of the foundry; the boiler shop and additional machine shops faced Main Street and are outside the right-of-way. These facilities were in operation for 35 years, until increasing demand made the site too constricted for the amount of work done; the works was dismantled and moved to a new site outside the project area in the years immediately before the 1906 fire.

After 1906, the right-of-way was acquired by the Southern Pacific Railway for use as its downtown freight terminal. This use of this freight yard resembled a similar facility in West Oakland, which is part of the right-of-way for the I-880 Cypress Reconstruction. The yard was not used for engine repair operations, but merely as a local downtown freight yard to serve nearby industries.

Block 3: Bounded by Howard & Mission, Main & Beale Streets

The Transbay Terminal Viaduct crosses Block 3 from Fremont to Beale Street, roughly midway between Folsom and Howard, occupying the sites of demolished industrial buildings dating from the post-1906 period, and the site of the Pioneer White Lead and Color Works lead paint factory and warehouse from 1875 until it was destroyed by fire in 1896.

Block 3 was originally part of San Francisco Bay, as can be seen on the 1852 Coast Survey Map. The original shoreline of Yerba Buena Cove crossed the adjacent Block 4: at low tide, Block 3 was covered with several feet of water. During the period from 1854 through the mid-1860s, the outfall pipe of the adjacent San Francisco Gas Light Company works was located near Howard and Beale on Block 3, and the works discharged tar residue onto the submerged portions of the block, including the Transbay Terminal Viaduct site. Photographs taken during the late 1850s show that the portion of the block traversed by the Transbay Terminal Viaduct was literally a tarflat, with the black tar residue standing out in contrast to scattered pools of water at low tide. During this period, Beale Street was gradually extended as a filled mole from Howard south to Folsom; not until the 1860s was it an open street at established city grade.

When it was built in 1875, the Pioneer White Lead and Color Works was the first major industry on Block 3. For the next two decades, the works had a practical monopoly on paint production on the Pacific Coast; virtually every building constructed during that period was painted with lead paint produced at the works. A four-story brick loft structure housing the white lead grinding mills, and storage of paint colors and bulk mercury. This building occupied the site of the Transbay Terminal Viaduct.

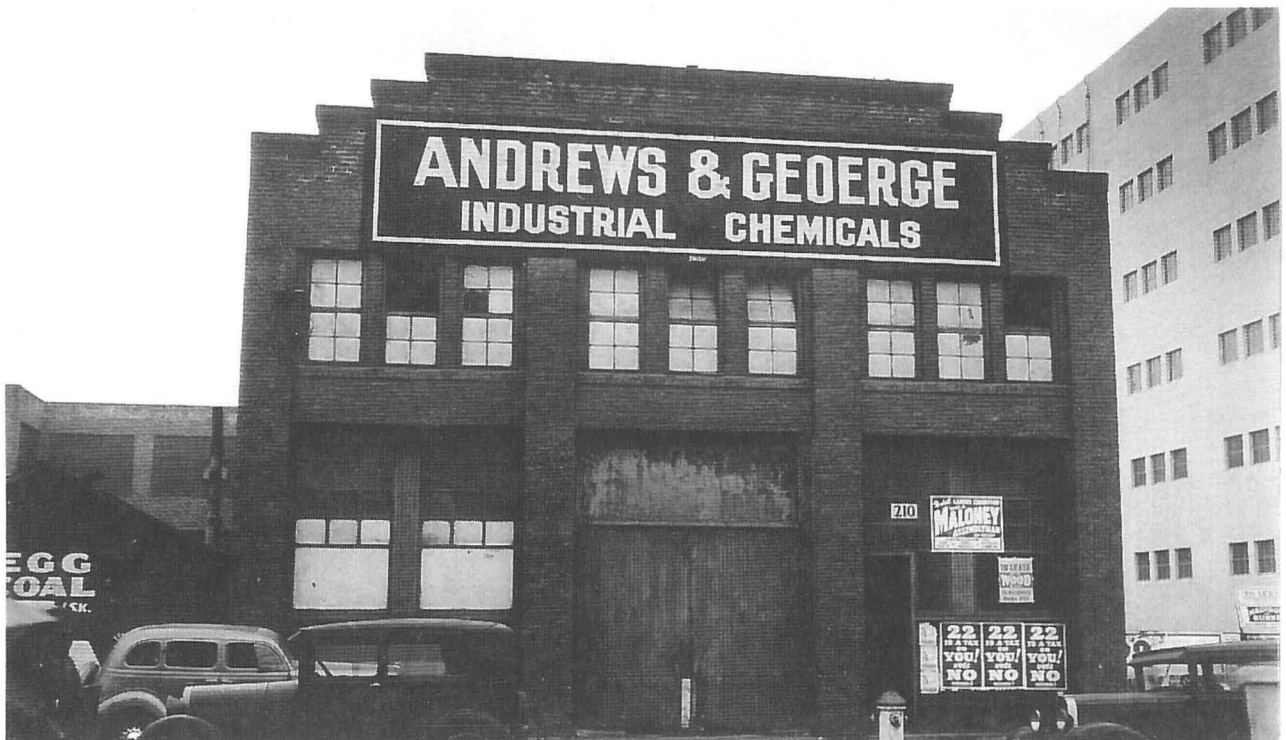
In 1896 a spectacular fire gutted the brick warehouses on the viaduct site, and consumed the adjacent corroding sheds. The lead works was not rebuilt, and the site of the corroding sheds remained vacant. The warehouse buildings on the viaduct site were rehabilitated to become the Whittier-Coburn Paint Company. This firm did not manufacture paint from pig lead; it operated more as a large paint wholesaler, and was one of the main competitors of the relocated Pioneer White Lead company--now known as Fuller-O'Brien Paints.

The 1906 fire destroyed the brick paint warehouses a second time, but this time they were not rebuilt above the second story. In the 1920s, the large Butler Brothers Wholesale Drug company warehouse was built on the land north of the paint warehouse building site; this building remains intact in 1993. The site of the corroding sheds was parcelled out and developed into yet another drug company warehouse along Fremont Street, and a machine shop and coal yard along Beale, both built during the 1910s.

The machine shop was built on the foundations of the old paint warehouse, including its basement substructure, and possibly brick walls above the ground. The machine shop closed during the early 1930s. The building then became the plant of the Andrews & George Industrial Chemical Supply Company. This company only used the building for a short period of time before it was demolished to make way for the Transbay Terminal



Plates 11 & 12: Built On the Foundations of the Pioneer White Lead Works, the building shown below was used as a machine shop and warehouse before housing the Andrews & George Industrial Chemicals Company in the 1930s; it was demolished for construction of the approaches to the Transbay Terminal. In the view above, the basement lies exposed, though it is not listed on either the 1913 or 1913/29 Sanborn Map. The basement is an artifact of the original 1875 lead works, and was used prior to 1896 for storing chemicals quite as hazardous as any that Andrews & George might have stocked. (both views, CALTRANS Bay Bridge Archive)



Viaduct. It is not known what industrial chemicals the company dealt in, but it is worth noting that it opened at a time when there were many expanding nearby pharmaceutical company operations, and manufacturers of office related products--ink, paper boxes, cleaning and pesticide products, printing and photographic establishments. By contrast, the metal working industries of Tar Flat were largely by time.

Plate 12 shows the Andrews & George Industrial Chemical building shortly before its demolition in 1937. Plate 11 reproduces a unique, post-demolition photo of its site. The dimensions and depth of the basement can be seen in Plate 11, including a door at its rear that had provided access to the basement of the northern half of the old Pioneer White Lead warehouse.

The eastern section of the Transbay Terminal Viaduct on Block 3 is built over the Industrial Chemical building and an adjacent lot that had remained vacant since 1906; earlier, the lot had been the site of a railway car manufacturer. To the west, the viaduct continues along the site of the Pioneer White Lead and Color Works building. After 1906, a structure similar to the Industrial Chemical Company building was erected on this site; it had a variety of tenants, including a wholesale drug company, but does not appear to have been used for any noteworthy industrial purpose.

Block 4: Bounded by First & Fremont, Folsom & Howard Streets

The Terminal Viaduct bisects this block, running from First to Fremont streets; as a result, it also crosses the original shoreline of the bay about eighty feet west of Fremont. The submerged parts of the block were filled early in the 1850s with sand taken from the bluff of the original shoreline. As a result, no portion of the viaduct crosses landfill that was subject to direct contamination from the San Francisco Gas Company works.

Between the 1860s and the 1930s, the Miners Foundry was in operation on a large site fronting on First Street; the northern portion of the foundry was demolished to accommodate the viaduct in 1937. The viaduct right-of-way crosses the original site forge shop and assaying room of the foundry (where miners could test out the foundry's inventions with their own ore samples). The foundry proper was to the south of the viaduct. After 1906, the part of the foundry demolished for the viaduct functioned mainly as a machine shop; the rebuilt foundry retained the traditional earth floor. To the rear of the complex, also on the viaduct right-of-way, were sheds used for storing flasks (in effect, molds), which do not present any likelihood of hazardous materials contamination.

The portion of the Terminal Viaduct right-of-way east of the Miners' Foundry is adjacent to the site of a small iron foundry, the Western Foundry, which is just south of the viaduct structure; after 1906, it was rebuilt as a machine shop. The viaduct itself crosses the site of a small, late 19th-century machine shop; after 1906, it was the site of a store and warehouse.

Immediately north of the viaduct, the International Printers Ink Corporation was constructed after 1906. To the rear of this factory was an open yard that contained an ink mixing shed, which abutted the viaduct. This plant remained in operation after the viaduct was built, and was still in business in 1947. The site of the ink mixing shed is 175 feet east of First Street; 100 feet west of Fremont Street; its south wall was five feet north of the viaduct.

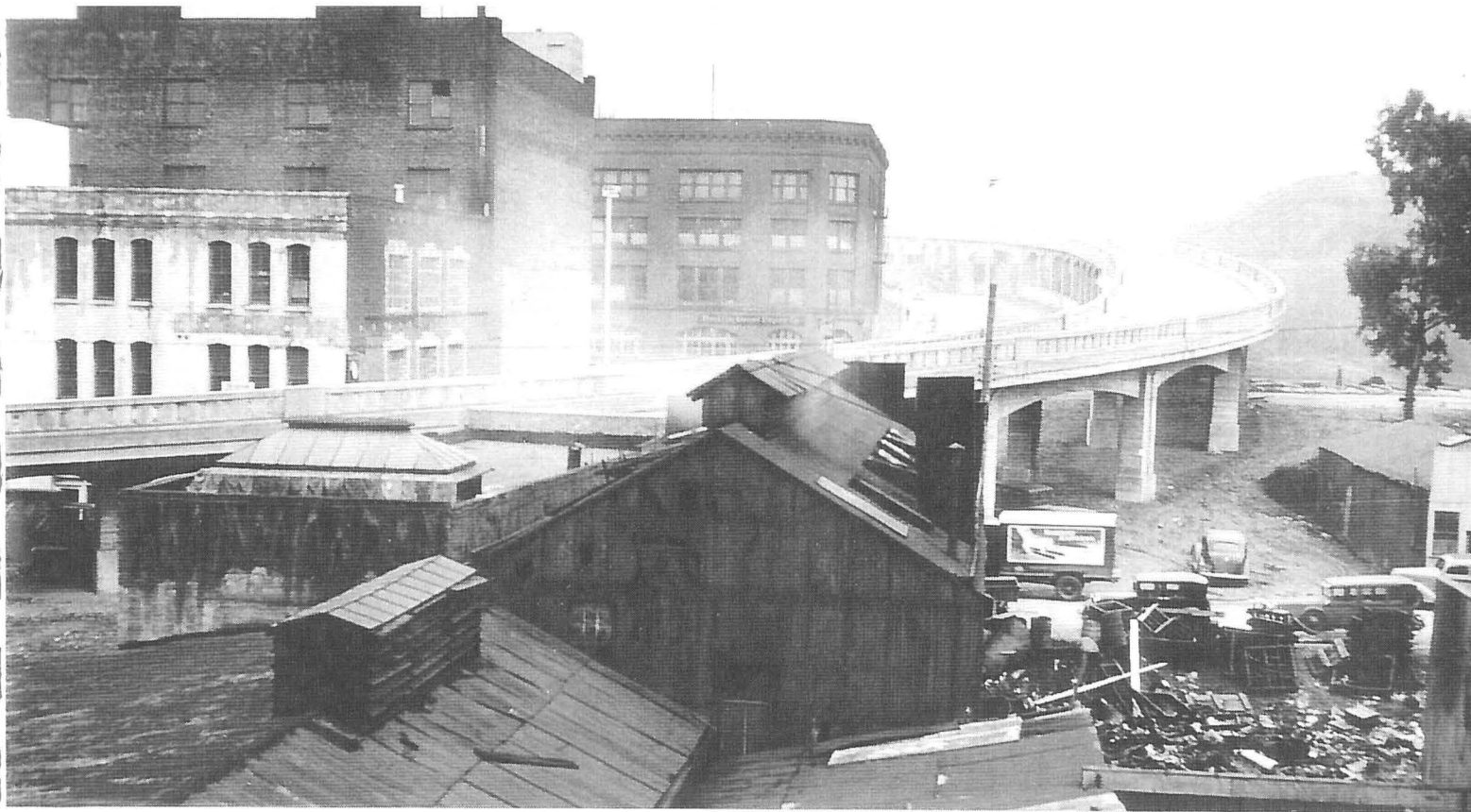
Block 5: Bounded by Second & First, Folsom & Howard Streets

The east and west section of the Terminal Viaduct meet on Block 5; all of the footings of the viaduct are on land that had been the site of light industries in the post-1906 period. Block 5 was first studied for the SF-480 Terminal Separation Rebuild; however, the right-of-way of that project crossed only a small portion of the block, while the Terminal Viaduct involves quite different sections of the block.

Block 5 originally consisted of sand dunes that were cut down and used to fill intervening hollows, and the shallows of Yerba Buena Cove, in the mid-1850s. Until the 1890s, the portion of the block traversed by the Terminal Viaduct was in residential use. Industry began moving in along First and Folsom streets in the early 1890s; but most of the area remained residential until 1906.

The portion of the viaduct leading in to the terminal building was constructed on the sites of several industrial buildings dating to the immediate post-1906 period; the Fremont Street approach to the Bay Bridge adjoins the inbound ramp of the terminal viaduct, but was constructed slightly earlier.

Two industries can be seen on Plate 12, taken in 1937 and looking south towards and looking south towards Rincon Hill. One of these was a plumbing shop operating out of a small, one-story building located on Clementina Street; the plumbing shop was demolished for the terminal viaduct in 1938. Potential hazardous materials contamination arising from the plumbing shop could include adjacent yards, which remained vacant after 1906. Directly across Clementina from the plumbing shop was the San Francisco Brass Foundry, occupying a sheet metal structure built as a brass foundry circa 1908.



Plates 12 & 13: The Fremont Street approaches to the Bay Bridge were newly completed in January of 1937, when the view above was taken looking south towards Folsom Street. The San Francisco Brass Works was still in business as one of the few surviving brass foundries of Tar Flat. The works typified the non-ferrous metal shops of the post-1906 period. Note the brass works' refuse yard immediately adjacent to it. *(Both views, CALTRANS Bay Bridge Archive)*



Errantum: Plate Number 12 repeated in error.

The brass foundry typifies the industries that moved onto previously residential sites on Block 5 immediately following the 1906 fire. Like many such industries, the San Francisco Brass Works occupied an inexpensive structure clad in sheet metal, erected in the hurry to rebuild after the fire and never replaced by a more substantial masonry building. The brass foundry's business was mostly with smaller castings; for example, specialized plumbing fixtures that could be used by the plumbing shop across Clementina Street. There is no evidence that the foundry was used for metal plating, but many brass foundries carried out limited plating operations in conjunction with the brass founding business.

A small machine shop was sited approximately 150 feet west of First Street, at 18-20 Clementina. The back of a sheet metal works that fronted on Tehama Street is immediately adjacent to the viaduct structure, 100 feet west of First Street. The American Forge Company occupied a large building whose east wall was 220 feet west of First Street. After the demolition of part of this building for the terminal viaduct, the remaining part, on Tehama Street, was used as a brass foundry through the late 1940s.

A second portion of the viaduct structure on Block 5 consists of the junction between its east and west portions, located midway between First and Second streets, extending from Clementina to Folsom. Wholly residential before 1906, this section of the right-of-way was partly vacant land when the viaduct was constructed. A small machine shop at 51 Clementina had a concrete floor; two small houses occupied a small part of a large lot now filled by the viaduct structure. Also on this lot was a plumbing operation, occupying a small, one story shed-type building from the 1920s into the 1930s.

A third portion of the Terminal Viaduct extends from Howard Street southwards, to link up with the section discussed above at Clementina Street. The section between Howard and Tehama streets does not appear to have been the site of any hazardous materials industries. Between Tehama and Clementina the viaduct right-of-way is on the site of the Ajax Foundry, an iron foundry that continued to make iron castings through the 1930s.

South of Folsom Street, the Transbay Terminal approach right-of-way crosses a section of Rincon Hill that was entirely residential prior to 1906, and was mostly residential up through the 1930s. This part of the hill was substantially cut down for construction of the Fremont Street approaches to the Bay Bridge. This section of the right-of-way does not appear to present any significant historic potential for hazardous materials contamination.

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April 18-21, 1906. Map Room from Gerstle Mack papers.



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Olmsted, Roger
Tar flat and t
Terminal

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Olmsted, Roger Wolcott.
Tar flat and the Transbay
Terminal



Nearing completion in mid-1938, the approaches to the Transbay Terminal rested on the filled lands of Tar Flat. The approach viaducts themselves were a significant engineering and architectural accomplishment; the steel beams seen here could carry the heaviest trains. The Terminal was built at a time when the Tar Flat metal-working industries were largely moribund, while those that remained struggled to carry on crafts that were already considered old fashioned. But in the second half of the 19th century, the industries of Tar Flat represented engineering achievements as significant to their times as the building of the great bridge was to the San Francisco of the 1930s.



(CALTRANS Bay Bridge Archive)